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DOI 10.25789/YMJ.2020.70.11

УДК 796.35:159.9.612.018(571.56)

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EVALUATION OF PSYCHOLOGICAL STATUS AND LEVEL OF CORTISOL AND TESTOSTERONE IN THE PRE-COMPETITIVE PERIOD OF YAKUTIA ATHLETES

We examined 37 highly qualified freestyle wrestlers (candidates for master of sports (cms)) of Yakut nationality, aged 17 to 21 years. The control group consisted of 22 young men of students of the same age who are engaged in physical education at least twice a week. The article presents the results of studies of the level of psycho-emotional state in highly qualified martial artists in the pre-competition period. The level of situational and personal anxiety was high in 8 and 11% of athletes and in 23 and 36% of students, respectively. In the group of athletes, low depression was detected in 11, moderate in 6 and high in 7%. The level of depression in the group of students was 32, 9 and 5%, respectively.

The aggressiveness index showed that most young men have a low level of aggression, among athletes 61% - students 73%. In both groups, young men with a high level of aggression were not identified. In the first group of youths with a low and high index of hostility, there were 50 and 34% less than in the second, respectively. The willingness of athletes to compete depends on the psycho-emotional state, which can both contribute to the achievement of high results and prevent it.

Keywords: psycho-emotional state, testosterone, cortisol, athletes, psychological preparedness, Yakutia.

Introduction. The result of the performance of athletes in competitions is determined by the mechanism of behavior and specially directed actions, which are caused by the development of physical qualities, the level of technical preparedness, functional and mental capabilities [5, 7, 9, 16].

In conditions of direct pre-competitive training for a short period of time, it is impossible to significantly develop physical qualities, improve equipment, etc., therefore, at this stage, the athlete's psychological preparedness for competitions is of particular importance [1, 11]. Athlete participation in competitions, especially qualifying or high damage, is stressful. It is known that moderate stress has a positive effect on the effectiveness of training and competitive activity, and excessive stress leads to negative consequences [11].

The effects of stress are due to neurochemical changes in the body. In a state of acute physical and emotional stress in athletes, the hypothalamic-pituitary-adrenal system is activated, which leads to changes in the hormonal profile [5]. Changes in the concentration of hormones make a significant contribution to the course of physiological processes in the North and help to stabilize the processes of adaptation of the body of athletes to changing environmental conditions and high physical activity [4]. Steroid hormones act on the central nervous system, regulate not only neuroendocrine function, but also behavioral, emotional processes, such as thinking, sleep, perception, as well as emotional states: depression, anxiety, aggression [6; 10]. It is believed that aggressiveness contributes to the implementation of strength and explosive exercises. At the same time, it is associated with testosterone. The question arises of how much emotions of this kind affect the changes in the level of testosterone and cortisol when performing strength exercises. Testosterone provides confidence and motivation, but when there is too much of it, positive qualities are replaced by negative ones. Testosterone activates the subcortical regions of the brain responsible for aggressive behavior, while cortisol and serotonin act as antagonists and reduce the effect of testosterone. Researchers associate aggression in

sports with sports specifics, the athlete's level of training, his individual psychological characteristics, and the research results are very contradictory.

The purpose of this study was to assess the level of psycho-emotional state and steroid hormones in freestyle wrestlers in the pre-competition period.

Materials and methods. A total of 59 young men aged 17 to 23 years were examined. The first group consisted of 37 athletes of freestyle wrestlers, highly qualified (candidates for master of sports (cms)), the Republican College of Olympic Reserve. The second - 22 youth students from the North-Eastern Federal University named after M.K. Ammosov engaged in physical education at least twice a week.

All subjects examined had blood taken from the ulnar vein in the morning (8-10 h) in a state of relative rest, on an empty stomach, from athletes 10-14 days before the competition. An enzyme-linked immuno sorbent assay of hormones (cortisol, testosterone) was performed in serum using AlkorBio kits (Russia), according to the manufacturer's instructions. The results of enzyme immunoassay of hormones were taken into account on a photometer (Picon, Russian Federation).

Psychological examination methods were carried out using the Bass-Dark questionnaire to study aggression, the Beck depression questionnaire, the Spielberg-Khanin anxiety test and the neuropsychological adaptation questionnaire (NA). The study was approved by the decision of the Local Ethics Committee at the FSBSI YSC CMP and performed with the informed consent of the subjects in accordance with the ethical standards of the Helsinki Declaration (2000).

Statistical processing of the obtained data was carried out using the SPSS Statistics 26 software package. The significance of differences was determined by the Student t-test for independent groups, the Mann-Whitney criterion. The critical value of the level of statistical significance of differences (p) was taken to be 5%.

Results and discussion. The average age of athletes was 18 (18; 19), students-19 (18; 22) years. According to the results of the study, it was found that the indicators of the psycho-emotional state did not have significant differences in the examined groups and varied within the normal range (Table 1).

Moreover, in the first group, lower indices were found for the three studied parameters, compared with the second (the average level (NPA) was lower by 29%, (SA) - 13% and (D) - 47%,) respectively, which may indicate a better psychological adaptation in this group (Table 1).

Analysis of the level (SA) among the examined individuals showed a predominance of a moderate level in both groups of subjects (Fig. 1). There were 13% more athletes with a "low" level (SA), and 10% fewer with a "high" one (Fig. 1) than in the second. Studies (PA) showed that athletes with a graduation of "moderate" level (PA) were 39% more, "low" and "high" - 54% and 70% less (Fig. 1), compared with students. Increasing feelings of excitement, anxiety, fear of competition is a normal reaction of the body. A successful performance requires some optimal level - this is the so-called "useful anxiety". On the other hand, a very high anxiety or indifference "but I do not care" adversely affect the activities of the athlete and can lead to poor results in competitions.

Anxiety performs the function of adaptation, warns of external or internal danger, tells the body that measures must be taken to prevent the danger or mitigate its consequences. These measures may or may not be conscious. Studies show that moderate anxiety, as a personal quality, can increase the ability to achieve success in the activity performed. However, the price of such success may be the predominance of negative experiences, increased anxiety and sleep disturbance. young men who do not have certain skills of mental self-regulation, having little experience in competitive activity, with a lack of information about rivals in the upcoming competitions, become easily excitable, are not confident in their own abilities, it's enough to simply knock them off of a positive attitude [3].

It is also known that athletes whose anxiety is expressed in aggressive actions usually do not achieve high athletic performance. This also applies to individuals who are not able to control themselves and control their emotional and physical state during stress [2, 17]. The indicator (IA) in the first group was increased (by 17%), compared with the second group, which does not contradict

Indicators of the psycho-emotional state and level of hormones in athletes in the pre-competition period and students engaged in physical education 2 times a week. M (25% Q_1-75% Q_3)

Research indicators	Surveyed groups and size	
	1 group athletes. n=37	2 group students. n=22
Neuro-psychic Adaptation (NPA) points	13.5(6.0; 21.5)	19.0 (11.0; 25.0)
Situational Anxiety (SA) points	34.5(28.5; 37.0)	39.5 (31.0; 43.0)
Personal Anxiety (PA) points	40.5 (35.0; 43.0)	39.5 (32.0; 48.0)
Aggression Index (AI) points	15.0 (13.0;19.5)	12.5 (8.0; 19.0)
Hostility Index (HI) points	5.5 (4.0; 8.0)	6.0 (4.0; 8.0)
Depression (D) points	4.5 (1.5; 9.0)	8.5 (5.0; 12.0)
Cortisol (C)(150-660 nmol/L	538.48 (485.76;559.72) *p=0.01	591.06 (527.04; 624.73)
Testosterone (T) (12.1-38.3 nmol/L)	26.75 (21.19; 33.60)	30.64 (27.12; 36.83)
Testosterone / Cortisol Index (T / K). conventional	0.057 (0.046; 0.066)	0.052 (0.37; 0.058)

Note: * <0.05 compared with the second group.

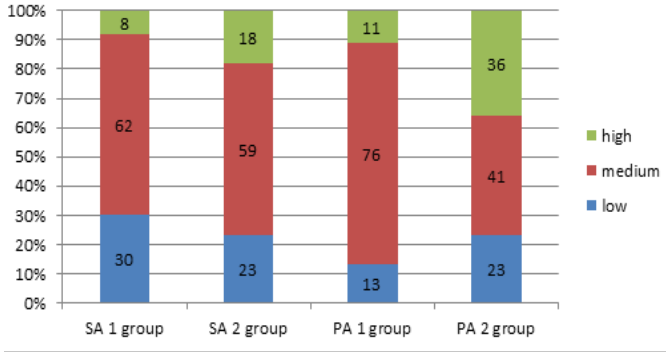

Fig. 1. The level of situational and personal anxiety of athletes in the pre-competition period and among students engaged in physical education 2 times a week, (%).

the literature (Table 1). According to E.P. Ilyin (2009), the aggressiveness and conflict in athletes is slightly higher than in individuals who are not involved in sports. Moreover, the athletes involved in contact martial arts, the aggressiveness is much higher than that of athletes and skiers [7]. In both groups, studies of young men with high (IA) were not detected. There were 31% more athletes with normal (IA). The majority of those examined had a low level (IA) (Fig. 2).

If we talk about aggression and anxiety, then athletes with a predominance of aggression over anxiety are better prepared for competition [14]. In the process of personality socialization, aggression frees people from fear, helps to defend their interests, protects against external threats, and helps to adapt. Often the concept of "aggressiveness" is replaced by the concept of "sports anger." Sport allows you to express aggressive feelings without causing much harm to other people, forming constructive forms of athletes' aggressive behavior. According to the results of the study Petrygin S.B. [15], aggression plays a leading role only at the initial stage of a sports career, and in all subsequent it is a factor in inhibiting the growth and effectiveness of sports indicators. Aggression that occurs in the initial stages of the practice of martial arts is associated with such values as a sports result, victory in competitions, intransigence to shortcomings, the desire to assert oneself at the expense of others. The experience of martial arts influences a decrease in the level of aggression, since there are changes in the individual's value system, causing a shift in the value orientation from the practical result to the process itself.

The hostility index was normal for the majority of young men (Fig. 2), but in the first group of young men with a low and high index of hostility was less by 50 and 34%, compared with the second, respectively. Spearman correlation analysis showed that (IV) had positive correlation in the group of athletes with (SA) ($r = 0.346$; $p = 0.023$), (PA) ($r = 0.420$; $p = 0.021$) and with (AI) ($r = 0.523$; $p = 0.002$), and in the group of students with (NPA) ($r = 0.495$ $p = 0.019$) and with the level (D) ($r = 0.560$; $p = 0.007$).

The level of depression in the first group was 13% (moderate –6, high –7), in the second –14% (moderate –9, high –5) (Fig. 3). However, in the first group of young men with no depression, it was 28% more, and with low depression 66% less (Fig. 3). This is probably due to the fact that normalized physical activity contributes to the production of chemical elements - endorphins, which act on certain neurotransmitter systems in the brain as antidepressants and help improve attitude to life. However, sports can be a source of suffering and many professional athletes suffer from depression, which can be caused by stressful physical and psycho-emotional stress. Going in for sports educate character, self-discipline, hard work, responsibility and other moral and volitional qualities, but few achieve high sports results at the international level [13].

Based on our results, it is clear that the levels of testosterone and cortisol in the blood serum in both examined groups were within the physiological norm (Table 1). The testosterone content did not have statistically significant differences in both groups. The cortisol level in the first group was statistically significantly lower than in the second ($p = 0.01$) (Table 1). Cortisol determines the development of special performance, and therefore an increase in its concentration during different training cycles is accompanied by an improvement in the sportsman's athletic performance. In normal amounts, cortisol is necessary for metabolism, but its chronically elevated level caused by training stress leads to a worsening of the response to stress, which almost always leads to a decrease in testosterone production in endurance athletes. A decrease in testosterone leads to increased fatigue and depression, which do not allow you to deal with stress. To assess the training status and sports potential, to clarify the course of reactions, anabolic / catabolic processes, we determined the index (T/K). Despite the absence of significant differences in the groups, the group of athletes has a tendency to increase this indicator compared to a group of students, this is ideal, since it shows the predominance of anabolic processes, that the load on the body is adequate and the athletes are in good shape. Correlation analysis showed a weak positive correlation between the level of testosterone c (PA) in the first group ($r = 0.330$; $p = 0.044$), and in the second group the level of cortisol c (HI) ($r = 0.553$; $p = 0.008$). In both groups, testosterone levels correlated with the T/K index, in the first group the correlation coefficient was ($r = 0.700$; $p = 0.000$), in the second ($r = 0.646$; $p = 0.001$). Athletes often ignore the factor of psychological stress, however, this may be the reason for such a wide variability of the training effect on the level of hormones.

Conclusion. Thus, indicators of the psycho-emotional state of fighters in the pre-competition period should be considered as a characteristic of the psycho-physiological adaptation of the body and psychological readiness for competition. In order to fully realize the potential capabilities of athletes in competitions and achieve their highest sports result, great attention must be paid to the psychological support system. Conduct individual psycho-diagnostics of personality characteristics, its mental states, to identify athletes experiencing psycho-emotional disorders and teach them the skills of mental self-regulation.

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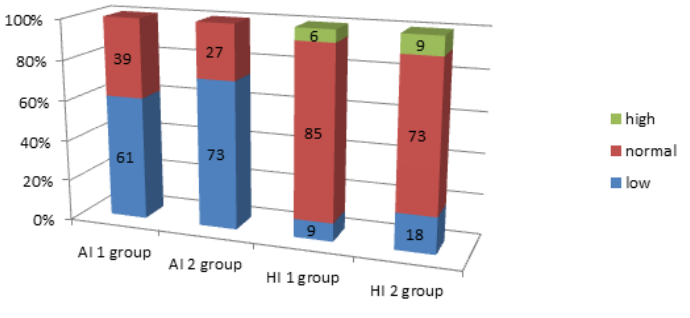

Fig. 2. Indices of aggression and hostility of athletes in the pre-competition period and among students engaged in physical education 2 times a week, %.

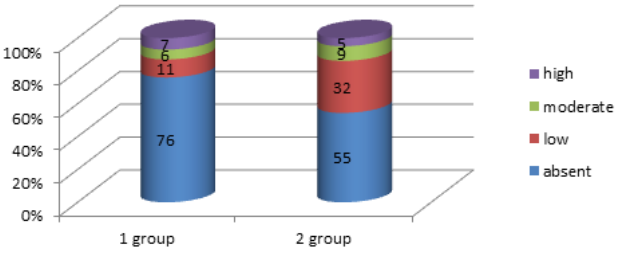

Fig. 3. The level of depression in athletes in the pre-competition period and in students engaged in physical education 2 times a week, %.

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