Stress Management Mechanisms in Younger Athletes

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Abstract: Background/Purpose: Physiological responses to stress are associated with tension in the autonomic nervous system. One of the physiological reactions to stress is the tension of the autonomic nervous system. Intense physical activity and emotional stress can provoke mental stress in young athletes. Purpose - to study the features of the mechanisms of stress management in young athletes.

Method: Method: 30 younger athletes were examined (Greco-Roman wrestlers, 13-16 years old). Young athletes represented the Kremenchug sports club. Heart rate variability (HRV) was assessed using a Fazagraph computer electrocardiograph (Ukraine). The characteristics of the statistical and frequency analysis of heart rate were evaluated. HRV indicators were recorded before and after the competition. The study of statistically significant difference between the obtained results carry out with help Wilcoxon rank sum test.

Results: During the competition the meaning of LF increases with simultaneous a decrease in HF oscillation. This fact is associated with a high level of tension in the regulatory mechanisms of HRV in younger athletes in a competitive state. At the same time, the parasympathetic activity of autonomic regulation is decline. Result shows the development of stress during psycho-emotional strain in competition condition. The stress caused by competitive situation in younger athletes is characterized by an increase in the tension of the autonomic regulation of HRV with deterioration in sympathetic and parasympathetic activity. The stress caused by competitive situation in younger athletes is characterized by an increase in the tension of the autonomic regulation of HRV with deterioration in sympathetic and parasympathetic activity.

Conclusion: It was revealed that the conditions of competition among young athletes provoke a stress reaction with a predominance of sympathetic regulation. The mechanism of prevention of competitive stress in younger athletes is associated with a change in the ratio of autonomic regulation of the heart rate.

Keywords: Stress management, Younger athletes, Heart rate variability.

INTRODUCTION

Modern sport is characterized by a high level of psycho-emotional stress in extreme conditions of competitive activity [1, 2]. During intense competitive activity, the athlete's body is subjected to physical and mental stress. One of the physiological reactions to a stressful state is the tension of the autonomic nervous system [3].

There are studies of adaptive responses to intense physical and emotional stress in young athletes [4, 5]. The mechanism of stress resistance and coping with the psycho-emotional state during competitive activity was revealed [6, 7].

Heart rate variability is an informative measure of stress response in sports. Traditionally, to assess stress conditions in athletes, statistical, frequency, and integrative approaches to heart rate variability were used [8].

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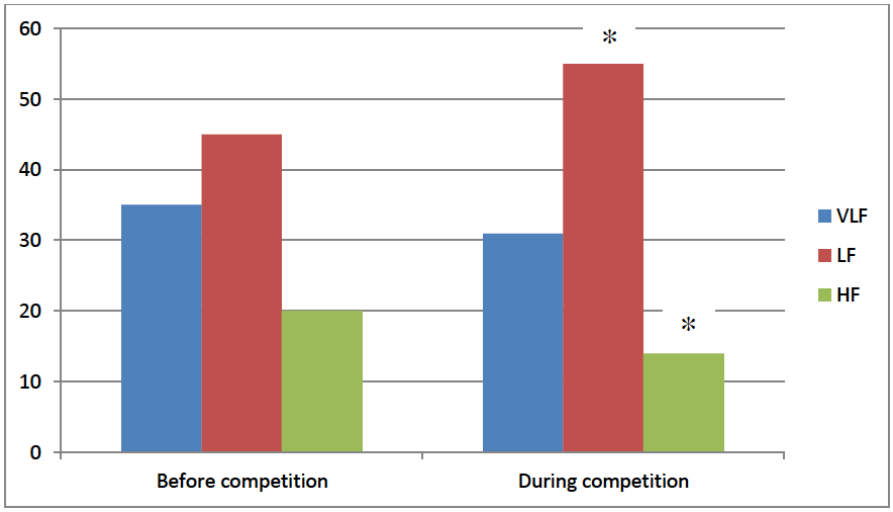
As is known, modern youth sports are characterized, on the one hand, by a healthy lifestyle, and, on the other hand, by early specialization [9]. Thus, sports among young people require careful management and optimization of the training process [10]. Insufficient physical activity and emotional stress can provoke mental stress in young athletes [11]. That is why the study of stress management mechanisms in young athletes is of great importance.

Purpose: to study the features of stress management mechanisms in young athletes.

PATIENTS AND METHOD

30 younger athletes (Greco-Roman wrestlers, age 13-16) were examined. Younger athletes represented the Sport Club Kremenchuk city.

All of these persons agreed to the use of research results for scientific work, according recommendation of Ethics Committees for Biomedical Research. The research was carried out before and during the competition.



Legend: * p =.01, compared to before competition.

Figure 1: Frequency analysis of HRV in younger athletes before and during competition.

The heart rate variability (HRV) was assessed by computer electrocardiographic "Fazagraf" (Ukraine). We used an approach analysis of HRV in accordance which the recommendation of European Association of Cardiologist. The characteristics of statistical and frequency domain analysis of heart rate were assessed. The parameters of HRV were registered before and after competition.

For analysis of our research data the "Statistica 12" software were used. The study of statistically significant difference between the obtained results carry out with help Wilcoxon rank sum test. An interquartile range was used to represent the distribution of data, indicating the lower (25% percentile) and the upper quartile (75%).

RESULTS

The result of the study of HRV frequency analysis in younger athletes before and during competitions shows the predominance of low-frequency (LF) fluctuations in heart rate before competitions comprise to very low-frequency (VLF) oscillations (Table **1**). The result obtained indicates the influence of the sympathetic mechanisms of the autonomic regulation to the sinus node in younger athletes before the competition. A decrease in the level of meanings of high-frequency (HF) oscillations testifies about influence of the parasympathetic system in younger athletes.

During the competition the meaning of LF increases with simultaneous a decrease in HF oscillation. This fact is associated with a high level of tension in the regulatory mechanisms of HRV in younger athletes in a competitive state. At the same time, the parasympathetic activity of autonomic regulation is decline.

The dynamics of ratio (LF/HF) corresponded with changes variables in younger athletes (Table **1**). Obtained result indicates the developing of stress during psycho-emotional strain in competition condition.

Table 1: Characteristics of Heart Rate Variability in Younger Athletes before and During Competition (Median, Lower and Upper Quartile, n=24)

Variables	Before Competitive			During Competitive		
	Median	Lower Quartile	Upper Quartile	Median	Lower Quartile	Upper Quartile
LF/HF	2,25	1,48	3,73	3,92*	1,73	4,63
SD1, ms	94,73	72,63	125,72	64,64*	45,73	92,72
SD2, ms	168,24	116,34	237,73	93,43*	74,63	127,42

Legend: * p =.01, compared to before competition.

Scatterplot analysis of NN intervals shows a decrease in SD1 and SD2 in younger athletes during competition (Table **1**). The obtained fact is consistent with changes in LF and indicates an increase in the regulation tension due to periodic and aperiodic fluctuations in cardiointervals. In addition, the decrease in SD2 is associated with the activation of the sympathetic tone of the autonomic nervous system. At the same time, SD1 values correspond to the activation of parasympathetic autonomic regulation of the heart rate.

Indeed, the stress caused by competitive situation in younger athletes is characterized by an increase in the tension of the autonomic regulation of HRV with deterioration in sympathetic and parasympathetic activity.

DISCUSSION

In a competitive situation, due to physical and emotional stress, the corresponding functional states of the athlete's body arise [12, 13]. As a result of adaptive mechanisms, a complex of physiological reactions is formed, aimed at overcoming the negative environmental influences of psycho-emotional stress [14]. One of the mechanisms to compensate for stress during sports is the mobilization of the body's physiological reserves [15].

The dynamics of HRV obtained in our study indicates the excitation of the activity of the sympathetic and inhibition of parasympathetic links of the autonomic regulation of the heart rate in younger athletes in competitive activities. Thus, the predominance of cerebral vegetative centers of neurohumoral regulation was activated in younger athletes under conditions of psycho-emotional stress associated with competitive activity. At the same time, the dynamics of the scatterplot parameters is accompanied by changes in LF/HF and indicates an increase in the tension of heart rate regulation due to periodic and aperiodic fluctuations in cardio intervals. The revealed fact of the balance between the activity of the sympathetic and parasympathetic tone indicates the activation of the mechanisms of autonomic regulation in younger athletes.

One of the mechanisms for increasing stress resistance in young athletes in a competitive situation is related to the balance of sympathetic and parasympathetic activation.

CONCLUSION

It was revealed that the conditions of competition among young athletes provoke a stress reaction with a predominance of sympathetic regulation. The mechanism of prevention of competitive stress in younger athletes is associated with a change in the ratio of autonomic regulation of the heart rate.

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