

## HEART ADAPTIVE REACTION OF STUDENTS OF 18-22 YEARS WITH DIFFERENT TYPE OF MEAL FOR WORK OF SMALL MUSCLE GROUPS

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We studied heart reaction to the local tedious work of muscles of young people with a different mode of nutrition. We showed increasing heart rate, arterial tension and stress index on cardiointervalogram, which is typical for the functional state of heart stress. Functional stress is more appeared in the group of students who have a predominance of produced at fabrics and preserved food in meal. Diet with natural products is accompanied by less pronounced functional heart tension and it can be a means of preventing surge at long work of small muscle groups (local work of muscles).

For a long time in the human physiology efficiency of the organism has been studied with contraction of large muscle groups, for example during work or sport activity. There are many studies of means affecting to the rate of recovery processes including studies of various food products. But there are few researches of functional body condition changes during the work of small muscle groups (local load).

This work of small muscle groups is common among people of all ages. Scientists identified unfavorable influence of local muscle work on motional and circulation systems functions [1, 3, 4]. Physiologists suppose humoral mechanisms take part in extension of fatigue during the work of local muscle groups, but the opinion about central mechanisms of fatigue is pronounced more often [9].

Data [4, 6] which were obtained from people of different ages, showed an increase of all kinds of blood pressure including systolic and diastolic, reducing of the duration of the electrical diastole. These facts are regarded as amplification of sympathetic effects during and after the local load. Long local loads result in hypertension.

It's necessary to know about mechanisms of functional changes in organism during muscle local work. Results of studies will help us in searching of means of effect on these mechanisms to improve organism abilities for adaptation to local stress. Also it's necessary to search similar means including age characteristics of organism.

It's known that functional condition and human efficiency are depend on patterns of nutrition. There is rational making and using of food additives in producing of food products in many countries. They are used for increasing of nutritious and biologic value of products, improving their gustatory and aromatic properties, saving high quality of food and increasing its medical-prophylactic and dietary properties. However influence of food additives that were taken for long period of time isn't studied, especially for people of different age. At the same time it's known that many natural food products improve functional condition and efficiency.

Search of different means for prophylaxis of unfavorable effects of local muscle local work on the body is the interest of work and sport physiologists.

**The aim** of our study was to examine the adaptive reaction of the heart muscle for local work among 40 university students aged 18-22 who were divided into two groups. Group 1 (GP) consisted of students living in the big city, with a diet dominated by products from catering, including canned goods. Group 2 (GN) included students, who came from of small towns and villages, whose parents brought them the natural products including food from their own farms. Test subjects were controlled by rule of normal distribution in anthropologic and physical indicators.

**The techniques.** Test with local stress included hand's holding of static tension to one third of maximum load up to fatigue (i.e. up to inability to hold this tension) on the wrist dynamometer. The duration of work to fatigue ranged from 60 to 130 seconds. Before, during and after the work we recorded the heart rate (HR), arterial blood pressure (AP), electrocardiogram (ECG) during 5 minutes. We calculated statistical indexes of variability of the heart rate: amplitude mode (AMo) and the stress index (SI) in [2], which showed a degree of

tension of the central sympathetic mechanisms of the heart regulation. We did statistic processing of results taking into account differences by method t-criterion of Student.

**Results.** It turned out that after the local muscle work we observed some degree of increased heart rate and blood pressure parameters among the test subjects of all age groups (Table 1), including the diastolic (APd) and pulse (APp=APs-APd) parameters. The permanent feature of adaptive heart reactions for the local tedious work was increasing of the ADD and of index "double multiplication" ( $DM = HR * ADs/100$ ). This index is joined with energy spending.

Indicators APp and DP among subjects in group GN what means slight energy costs during heart work were lower than in group GP. Changes of APD and DM after local work among students in group GP were bigger than among students in group GN what shows functional heart stress among subjects GP.

Changes of cardiac rhythm indicators (AMo and SI) during local work also argue about intensification of activity of sympathetic effects on heart and about stress of central heart regulation mechanisms among all students. Rise of indicators AMo and SI during local work in group GN was less than it was in group GP (fig. 1). So in the GP group SI changes after exercise were from  $84,5 \pm 7,2$  to  $96,6 \pm 6,0$  conventional units ( $p < 0,05$ ); and in group GN - from  $61,5 \pm 8,4$  to  $67,0 \pm 9,4$  conventional units ( $p > 0,5$ ). Thus students with natural nutrition are exposed to less stress of central heart regulation mechanisms.

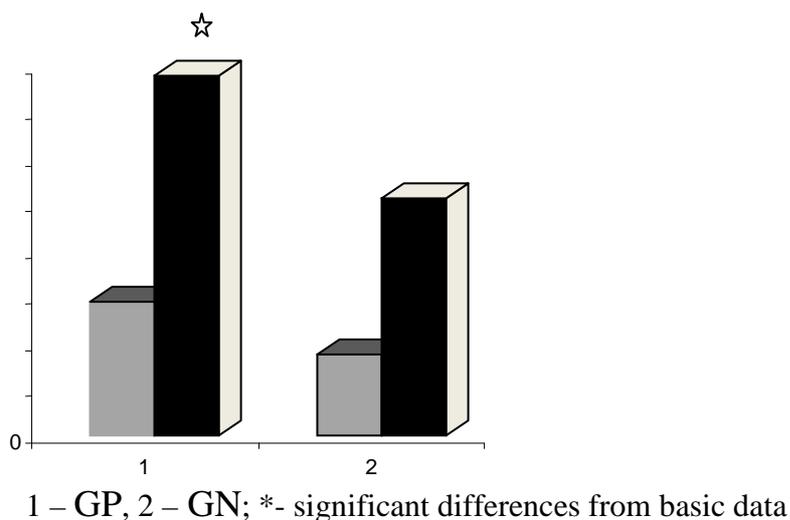
Table 1. Changes in heart rate and blood pressure after local work

	Indicators				
	HR	APs	APd	APp	DM
Boys	72,3±2,4	118, ±4,2	78,7±1,9	38,4±3,0	84,0±3,6
GN	80,5±2,7*	125,3±4,3	83,1±1,6*	41,8±3,0	100,0±3,5*
Girls	76,6±4,3	110,0±3,3	75,0±2,4	34,2±4,1	85,0±3,8
GN	78,9±3,7**	118,0±4,7	80,0±1,3*	38,1±3,5**	94,0±2,2*
Boys	77,2±3,2	122,0±6,1	79,4±2,8	40,9±2,4	91,2±3,5**
GP	84,3±2,9*	127,4±5,6	85,4±2,9*	44,3±3,2	102,4±5,4*
Girls	83,1±3,8	112,1±4,4	72,1±2,8	39,4±2,7	94,6±4,6**
GP	87,4±2,5	120,5±5,1	74,7±1,9**	45,3±3,2*	*103,3±4,9**

Notes: The first line horizontally – before work, the second - after work, \* - significant differences from basic data; \*\* - significant differences between groups; ADs - systolic, ADd - diastolic, APp - pulse arterial pressure.

These facts indicate the importance of central sympathetic mechanisms in formation of adaptive muscle reactions for local work which is made until fatigue. But these results point to possibility of directed influence on these processes. For example, a way of influence on central nervous system functional condition is relaxation, as we showed earlier [8], and natural meal, as we showed in this research. Modification of blood chemical consist which is connected with nutrition at first effects on nervous system and on activity of different hormones.

Fig. 1. Changes of the stress index (SI) after local load.



**Conclusion.** Different factors effecting as on central nervous system as on muscles affect on efficiency during local work. We can relate relaxation [8] to the first factors and effect of magnetic field [7] and other factors to the second. It's known intracellular processes play important role in character of contractile act. For example, reducing of micro- and macro-elements in organism entering with food causes disorder of regulation and adaptation processes, reducing of functional reserves, disease development [10].

Results of our research showed effect of correlation of local efficiency and type of nutrition. It's necessary to conduct comprehensive studies of different meal effect on local

muscle work. Apparently, factor of nutrition effects as on central as on local mechanisms of fatigue during local muscle work and it's necessary to consider it in correction of workers' meal during their work activity which is connected with long local muscle work.

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