

Resistance to Stress and Intellectual Efficiency of Students in Dynamics of Examinations

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Abstract

In work as authors experimental data on intellectual efficiency of students in a week and after the examinations are presented. Resistance to stress of students during the same periods of time was at the same time studied. Adequate methods of a research on students of the first course have been applied. Authors have revealed dynamics of intellectual efficiency of students in the conditions of the emotional pressure caused by examinations. In particular, the indicator of speed of visual and motor reaction has authentically increased that shows the formed exhaustion after passing an examination. At performance by students of the "Continuous Account at the Set Speed" task in series with a time interval between presentations of separate signals in 2,0 sec.; 1,4 sec.; 1,0 sec.; 0,8 sec. during examination statistically reliable increase of relative frequency of wrong answers is noted. By a technique "Sensomotor reactions to light signals" the relative frequency of wrong signs at students during examination has increased in comparison with background level at presentation of light signals with an interval 5,0 sec.; 1,0 sec.; 0,5 sec.

Keywords: resistance to stress, intellectual working capacity, examinations, students, deficiency of information, central nervous system, emotional tension, sensomotor reactions.

INTRODUCTION

The examination situation for most of modern students, as we know, has a shade of psychological tension, to be exact an emotional stress. Manifestation of stressful reactions at examination or during preparation for him is promoted by a set of factors among which there are features of higher nervous activity, plasticity of a brain and also excessively large or small number of educational information. The novelty, quality of a training material, complexity and probability of receipt of information at excess of "thresholds" of perception and assimilation can also strengthen displays of a stress at students during examinations.

The purpose of our research was assessment of resistance to stress and intellectual efficiency of students during various periods of examinations (one week prior to examination, during examination, in a week after the examination).

MATERIALS AND METHODS

The research has been conducted on 25 first-year students (age of 18-19 years, the I-II groups of health) faculty of training of elementary school teachers of the Southern Ural state humanitarian and pedagogical university.

The research was conducted on the UPDK-MK program complex the version PO 3/5/1221 by "Neyrokom" which represents a set of the verified techniques for determination of psychophysiological qualities [1, 2, 3]. As models of assessment of intellectual efficiency of students in the conditions of deficiency of time at examination we used tasks for perception of digital signals with the subsequent calculation and also response to the sequence of light signals. Activities for perception and processing of digital material were studied by means of the modified technique "The continuous account at the set speed" by consecutive presentation of digits of black and red color. It was necessary to make addition of two next numbers (if they were one color) or to define their absolute difference (if they were different color). Duration of intervals between presentations of separate numbers: in the 1st series – 3 sec.; in the 2nd – 2 sec.; in the 3rd – 1,4 sec.; in the 4th – 1 sec.; in the 5th – 0,8 sec. We estimated efficiency of performance of a task on the relative frequency of wrong answers (the wrong action, the admission of a signal) [4, 5, 6].

The technique of response to the sequence of light signals consisted in performance of sensomotor actions on emergence of a signal of red or green color. Signals were given on the examinee's panel through 5,0; 1,0; 0,5 sec., or after each previous

signal ("the automatic mode"), or after completion of response to the previous signal (the "manual" mode). In each series 32 signals of red and green color in a casual order were shown to the examinee. The size of the latent period of reaction and relative frequency of wrong answers was defined [5].

Activity of students in the conditions of deficiency of information was modelled in an experiment on identification of three voice-frequency signals (500, 1000, 1500 Hz) of weak intensity (up to 40 dB). After definition of a threshold of perception of voice-frequency signals to examinees in a casual order the sequence from 60 signals (on the 20th each tonality) by intensity plus 5 dB over a perception threshold against the background of the masking noise given to other ear was monaural shown. The examinee had to define the frequency characteristic of a signal as soon as possible. Relative frequency of wrong answers, average duration of recognition and coefficient of learning ability (by accuracy) during the experiment was determined.

Statistical processing of results of a research was carried out with use of the license Excel 2007 and Statistica 6.0 [6] Microsoft Office application programs. About reliability of distinctions of average sizes judged by Student's (t) criterion.

RESULTS AND DISCUSSION

On a ratio of processes of excitement - braking in CNS of students in many respects depend features of interpersonal communication among themselves and with the teacher [7, 8, 9]. Distinctive feature of communication at acute stress is the emotionality which can sharply strengthen or, on the contrary, suppress activity of interaction of people. Changes of communication at an examination stress happen under the influence of integrative interaction of stressogenny factors of an examination situation and various manifestations of mental functions of students (thinking, emotions, will, etc.) [7, 10]. These manifestations are caused by specific, personal features of the communicating people and also some other factors of external and internal environment. In our opinion, the stressogenny character of an examination situation gives to communication adaptation orientation (for example, specification of formulations, the content of the opened material, his specification, search of hints, etc.). Some students and also teachers prefer "to avoid" in general during the examination communication: the first need to concentrate, be prepared thus for the answer to questions, and the second aim students at independent preparation for the purpose of objective control of their knowledge [10, 11].

Most of students of the group investigated by us tried to communicate actively both one week prior to examination, and during the examination, communicating at the same time, trying to resolve problematic issues, to specify unclear terms, concepts, etc. As a rule, active communication during the examination is peculiar to those students who are poorly prepared in this subject and try to obtain thus any information, hints from fellow students or the teacher. They actively behave, can't quietly sit in the place, try to move on audience, to approach stands, tables, visual aids for the purpose of search of any information on unfamiliar questions of the examination card. Such students try to address repeatedly the teacher, ask to replace with him the ticket, ask a number of leading questions, etc. Quite often it leads to a conflict situation and in that case the vicious circle becomes isolated [8, 10, 11].

In certain cases communication during the examination promotes activation of thinking, "suggests" clever ideas, allows to argue logically. But it is characteristic of well prepared students who are masterfully using a training material for whom the insignificant hint helps to restore a chain of reasonings, to remember the material which is earlier studied by them. Sometimes strong emotional excitement, nervousness during the examination is the reason of a forgot of any fact, definition and this in advance familiar student of information needs the small hint for reproduction. Communication of students among themselves and with the teacher prior to examinations (for example, during consultation) also promotes activation of their thinking, enrichment by new information, systematization of the available knowledge. Among the studied group there were students who not absolutely possessed necessary information in a subject, but had the increased erudition, actively were able to apply knowledge from other areas and the scientific directions. They actively communicated with the teacher at the time of the answer to examination questions, is reasoned proved the point of view, giving to the answer in general the right direction, despite the absence of some factual data. It is abstract to think of ability, logically to argue plays an important role at examination, showing the level of erudition of the student. It very imposes some teachers, and they highly appreciate knowledge of this category of students. Really, the facts and formulations easily will be forgotten further, and the ability to scientific thinking, outlook, a logical reasoning will remain at the student for many years. Not without reason many experts claim that a problem of a higher educational institution not to teach the concrete facts, and to teach the student to study, to impart skills of search and judgment of new information, to teach to work with scientific literature, primary sources [7, 8, 10, 11].

The student by communication with the teacher can show the level of the knowledge of a subject, erudition degree, to realize the intellectual potential. From ability of the student it is correct to communicate, skillfully to focus attention on these or those facts, it is correct to perceive the questions asked him, the character sometimes prompting, the examination result in many respects depends. Some psychologists claim that synchronization of rhythms (heart rate, breath) at the student and the teacher plays a positive role at their communication on occupations in general and at examination in particular [9, 10, 11].

One of the personal characteristics defining success of examination activity of students is resistance to stress. Resistance to stress of the personality changes in activity with acquisition of professional experience, expressiveness of motivation, competence, skills and abilities of interaction, social contacts and supports, that is with achievement of the identity of sufficient level of professional socialization. The experience is less, the sensitivity to a stress and the less resistance to stress of the

personality is expressed more. [1]. Results of studying of resistance to stress in dynamics of examinations are presented in table 1.

The used technique of assessment of resistance to stress represents a kind of the difficult visual and motor reaction allowing characterizing a functional condition of the central nervous system of the person.

High rates of speed at the studied group, apparently, are one of characteristics of a complex of psychophysiological features. In the course of the examinations, an indicator the speed of visual and motor reaction undergoes reliable increase by 26% that shows the formed exhaustion after passing an examination.

Increase in time of visual and motor reaction with motivation at students allows to draw a conclusion on motivational increase in working capacity due to optimization of processes of sensomotor integration [1, 8]. Rather low indicators of coefficient of a variation indicate probable communication in the functional system "sensomotor reaction-mechanisms of regulation of activity of vegetative systems". Differences of changes of visual and motor reaction with motivation in the course of the examinations at students are 8,1%.

The interrelation of change of indicators of speed and accuracy in the course of testing at students is characterized by the range of value of quantity of mistakes from 0,94 to 1,68 that indicates presence of high level of any attention during the examinations despite emotional excitement [12].

Resistance to stress as a psychophysiological indicator characterizes individual and typological features of reaction in extreme conditions.

In Fig. 1, 2 results of assessment of intellectual efficiency of students (UR) in the conditions of deficiency of time ("The continuous account at the set speed", "Sensomotor reactions to the sequence of light signals") are presented.

We have established that at students during examination the condition of emotional tension in comparison with to the examination period (in 7 days prior to examination) which partially remains also in a week after the examination develops. As appears from the figure 1, at performance by students of the "Continuous Account at the Set Speed" task in series with a time interval between presentations of separate signals in 2,0 sec.; 1,4 sec.; 1,0 sec.; 0,8 sec. at them during examination statistically reliable increase of relative frequency of wrong answers respectively for 43,1% is noted; 39,9%; 43,5%; 39,8% in comparison with background level (in 7 days prior to examination). In 7 days after the examination these indicators have statistically authentically raised in series with a time interval between presentations of separate signals in 1,4 sec.; 1,0 sec.; 0,8 sec. respectively for 25,9%; 28,3%; 23,9% in comparison with background level that shows the proceeding exhaustion and emotional pressure at students in a week after the end of examination.

Increase of pulse at students during examination in comparison with background level (one week prior to examination) us is revealed in series with a time interval 1,4 sec.; 1,0 sec.; 0,8 sec. respectively for 27,8%; 33,7% ($p < 0,05$) and for 44,8% ($p < 0,01$) that also shows the increased emotional pressure of students during the examination. These indicators remain authentically raised and in a week after the examination in series with a time interval between presentations of separate signals in 2,0 sec.; 1,4 sec.; 1,0 sec. respectively for 12,1%; 17,2%; 19,1%. Follows from the above-stated data that at further reduction of a time interval between presentations of signals the specified shifts (on pulse rate) increase (Fig. 2).

Table 1. Results of the comparative analysis of resistance to stress of students in dynamics of examinations.

T3 (ms)		T4 (ms)		T3 (ms)		T4 (ms)	
In 7 days prior to examination				In 7 days after the examination			
M±m	CV, %	M±m	CV, %	M±m	CV, %	M±m	CV, %
348,32 ±14,98	4,3	319,49 ±20,59	6,3	438,87 ±52,12**	10,9	345,48±55,97 *	16,2

Note: T3 – the speed of visual and motor reaction (ms); T4 – the speed of visual and motor reaction with motivation (ms); * – p < 0,05; ** – p < 0,01 t-criteria of Student.

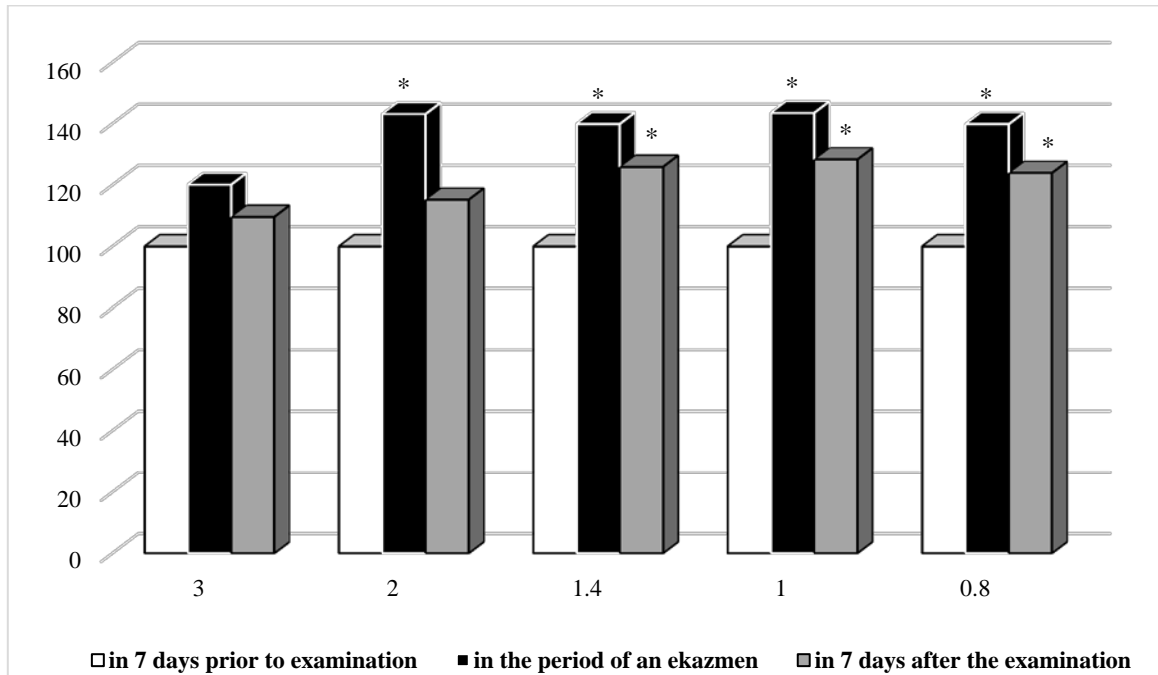


Fig. 1. Indicators of efficiency of intellectual working capacity and condition of vegetative functions at performance by students of the "Continuous Account at the Set Speed" task on the relative frequency of wrong signs (in %), % in relation to a background. Note: reliability of differences from the corresponding control: * – p < 0,05, calculated by means of Student's (t) criterion.

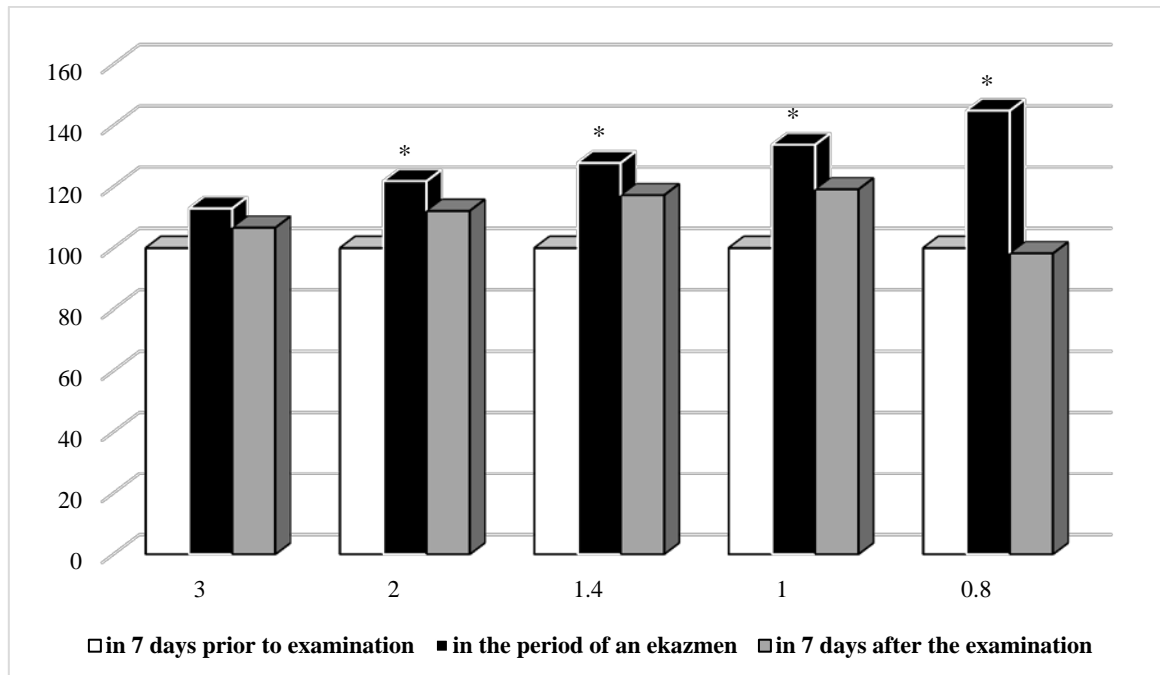


Fig. 2. Indicators of efficiency of intellectual working capacity and condition of vegetative functions at performance by students of the "Continuous Account at the Set Speed" task on pulse rate (beats/min), % in relation to a background. Note: reliability of differences from the corresponding control: * – p < 0,05, calculated by means of Student's (t) criterion.

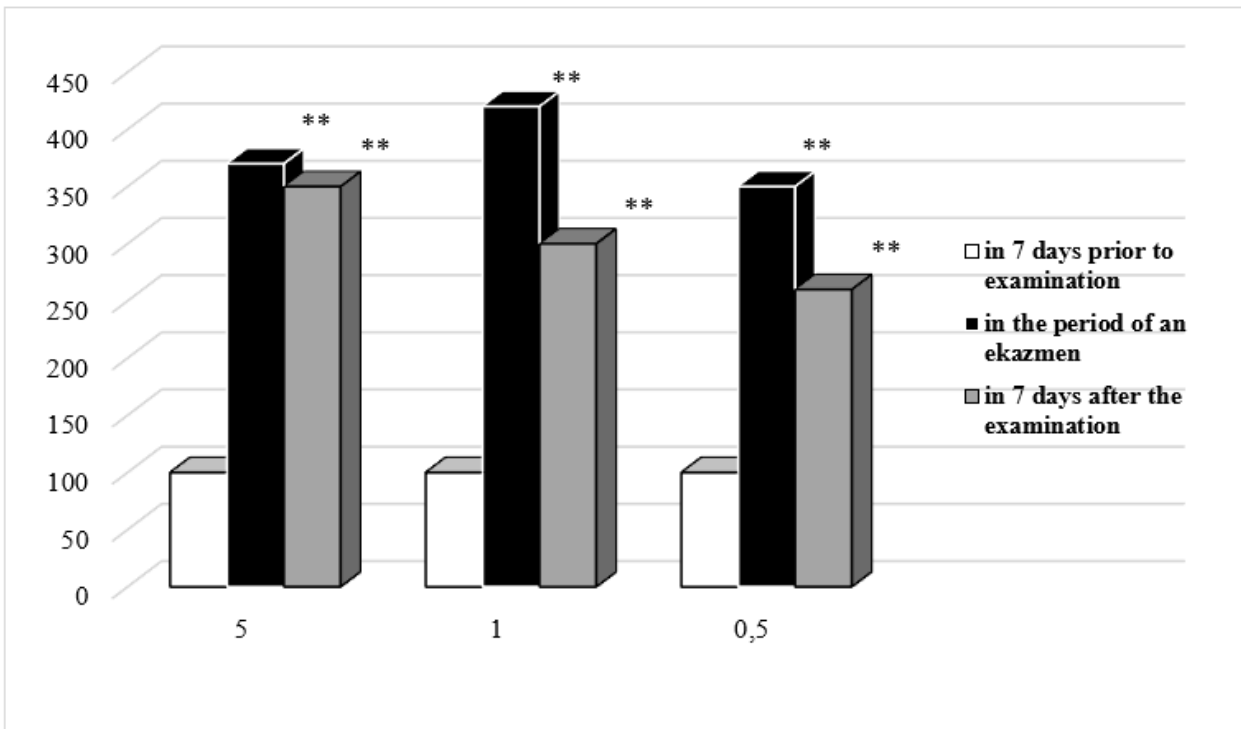


Fig. 3. Relative frequency of wrong signs (in %) at students by a technique “Sensomotor reactions to light signals”.
 Note: reliability of differences from the corresponding control: ** – $p < 0,01$, calculated by means of Student's (t) criterion.

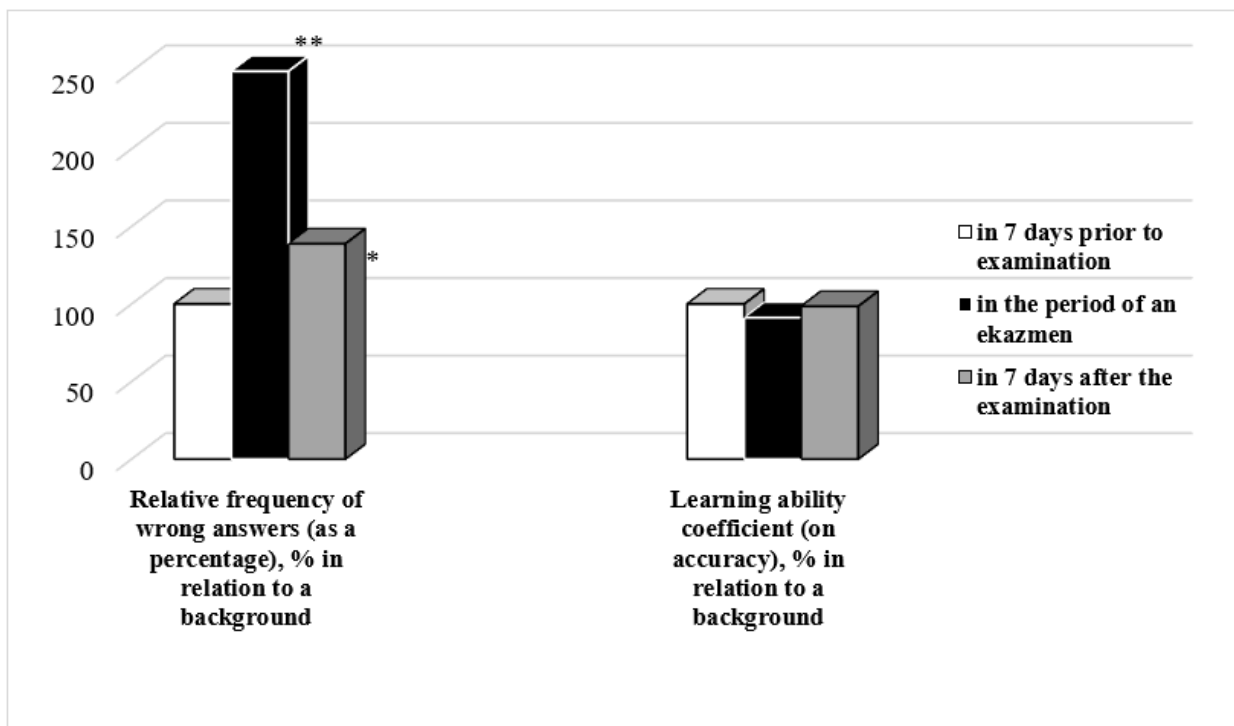


Fig. 4. Indicators of efficiency of intellectual efficiency of students in the conditions of deficiency of information.
 Note: reliability of differences from the corresponding control: * – $p < 0,05$; ** – $p < 0,01$, calculated by means of Student's (t) criterion.

When testing students by a technique “The continuous account at the set speed” it is established that the most essential changes (increase) in the relative frequency of wrong signs and from the vegetative sphere (heart rate) are noted in series with the following intervals between signals: in 7 days prior to examination – 1,4 sec.; 1,0 sec.; 0,8 sec.; during examination – 2,0 sec.; 1,4 sec.; 1,0 sec.; 0,8 sec.; in 7 days after the examination – 1,4 sec.; 1,0 sec.; 0,8 sec.

In the figure 3 the relative frequency of wrong signs at students by a technique “Sensomotor reactions to light signals” is presented.

As appears from the figure 3, the relative frequency of wrong signs at students by a technique “Sensomotor reactions to light signals” during examination has increased in comparison with background level at presentation of light signals with an interval 5,0 sec.; 1,0 sec.; 0,5 sec. in 3,7; 4,2; 3,5 times ($p < 0,01$),

and in a week after the examination remained raised respectively in 3,5; 3,0; 2,6 times ($p < 0,01$).

Very essential criteria of development of a condition of mental tension during examination at students were the data obtained at their research in the conditions of deficiency information in tasks on distinction of voice-frequency signals, provided in the figure 4.

Follows from data of the figure 4 that the relative frequency of wrong answers at students in the conditions of deficiency of information during examination has increased by 2,5 times ($p < 0,01$), and in 7 days after the examination I remained still raised for 38,8% ($p < 0,05$) in comparison with background level. Indicators of average time of reaction which during examination and in 7 days after him have been raised in comparison with background respectively for 68,1% ($p < 0,01$) and 49,1% had a similar tendency ($p < 0,05$). Increase in level of psychological tension at students during examination is demonstrated also by reduction by 8,8% in comparison with the background level of coefficient of learning ability (on accuracy). This indicator continued to remain lowered in 7 days after the examination in comparison with the period to examination, indicating partial preservation of mental tension at students.

Results of researches of intellectual efficiency of students indicate existence of a certain dissociation in the nature of change of indicators of overall performance, on the one hand, and indicators of a condition of vegetative functions, on the other hand, at different students. So, for example, at one students when performing the "Continuous Account at the Set Speed" task in process of shortening of intervals of time between signals, i.e. complication of a task, strengthening of vegetative functions and deterioration in indicators of intellectual working capacity is noted. At other students at implementation of the offered tests along with improvement of working indicators vegetative functions amplify. We have revealed small category of students at whom the expressed changes of vegetative functions in process of performance of intellectual tasks of different degree of complexity haven't been recorded. At all studied students during examination reliable decrease in indicators of intellectual working capacity according to all offered tests has been noted that demonstrates presence at them of a stressful state, the increased psychological tension. The similar state continued to remain with 54% of students partially even in 7 days after the end of examination, and at 43% the increased neuroemotional pressure has been recorded in a week prior to the examination. It should be noted that 77% of students from the last category prepared for examination in an "emergency" order, i.e. weren't engaged systematically during a semester and sought to study a training material for a short period. At 20% from this category of students the high level of personal and situational uneasiness which has probably caused their

increased psychological tension and also essential shifts of vegetative indicators (HR, AD) has been recorded.

CONCLUSIONS

Thus, the techniques of assessment of intellectual efficiency of students applied by us can be used for forecasting of degree of tension of students at influence of a complex of the specific factors connected with preparation, passing an examination and also the recovery period after him.

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