Article

Dynamic Changes Of Physiological And Psychological Parameters Of Young Persons As Asthenia Risk Factors

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Abstract: Asthenic syndrome is the most important problem of the modern stage of development of human society, which is the most important component of many pathological conditions or risk factors for diseases. The purpose of the study is to determine some physiological and psychological parameters in young people in dynamics at different levels of intellectual load and evaluate their role in the formation of asthenic syndrome.
Materials and Methods: The study involved 160 3rd year students of the Medical Institute of Moscow State University. N.P. Ogarev, divided into four groups according to the type of higher nervous activity (HNA), based on the indicators "Extraversion / Introversion" and "Neuroticism", determined by the Eysenck scale. We assessed the characteristics of emotional balance, functional parameters of autonomic regulation, features of cognitive functions in young people in different periods of training load.
Results: the indicator of neuroticism correlated with the severity of asthenic syndrome in young people. Persons with a high level of neuroticism more often revealed maladjustment of mental processes, a decrease in cognitive functions, and an increase in emotional instability during the period of intense intellectual loads. After a period of increased intellectual load, asthenia occurs significantly more often in females. Features of autonomic regulation have little effect on the development of asthenia. The exceptions were individuals with a high level of neuroticism. In these groups, the stress of hemodynamic mechanisms was occurred frequently.

Keywords: young people, cognitive functions, asthenic syndrome, autonomic regulation, risk factors, stress resistance.

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1. Introduction

Asthenic syndrome is the most important problem of the modern stage of development of human society. This is a state on the border between health and disease, depleting the functional and adaptive reserves of the body (factors of immunobiological resistance, the ability to perform intensive physical and intellectual labor, the general reactivity of the body), and it is also a risk factor for the development of organic pathology on the part of many organs and systems [1]. Basically, the etiological factor in the development of asthenia is long-term stress, which is most susceptible to young people, since an integral part of their lifestyle is training in educational institutions of higher and secondary vocational education. A particularly high level of stress in students is observed during the session, when assessing the knowledge they have gained and assessing their competence. To prevent complications of asthenia, it is necessary to diagnose its development in students in a timely manner, as well as to have an idea of the predisposition to it, depending on the type of higher nervous activity (HNA), psychological and functional individual characteristics. In recent years, a progressive direction of state policy in the field of education is the personification and development of individual training programs in accordance with the personal characteristics of students [2]. In this regard, the most important task is to determine the influence of physiological and psychological factors on the development of asthenia and stress resistance.

The goal of our study was to determine the risk factors for the development of asthenic syndrome based on the study of the characteristics of emotional balance, the functional parameters of autonomic regulation, and the characteristics of cognitive functions in young people with different types of higher nervous activity in different periods of academic load.

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The volume of original articles, literature reviews, and articles of the section "To Help a Practical Physician" should not be less than 7 pages and should not exceed 15 pages for original articles, from 10 pages to 25 for – review articles, and for notes from practice – from 5 to 10 pages. The article should have no more than 6 figures and / or 6 tables. The editors reserve the right to shorten articles.

Original articles should have the following sections: headnote, material and methods, research results and discussion, conclusion or inference.

Authors should use English-language scientific terminology and not use "tracing-paper" of terms transcribed from foreign words. The abbreviation of words and names, in addition to the generally accepted abbreviations of measures, physical and mathematical quantities and terms, is allowed only with the initial indication of the full name. Highly specialized terms should be deciphered. We do not recommend using abbreviations in the title of the article.

The article should be carefully verified by the author. In mathematical formulas, it is necessary to clearly mark all the elements: Latin and Greek letters, superscripts and subscripts, uppercase and lowercase letters; letters and numbers similar in spelling.

The names of the microorganisms are written in Latin and in italics.

Requirements for the presentation of statistical analysis:

The methods of statistical analysis used in the study should be described in the subsection "Statistical analysis" at the end of the section "Materials and Methods". It is necessary to describe statistical methods in as much detail as is necessary to assess their adequacy and to confirm the results obtained by knowledgeable readers, subject to access to relevant data. Description and presentation of the results of statistical analysis should comply with the Guide "Statistical analysis and methods in the published literature"

The list of literature attached to the article should include the works of domestic and foreign authors over the past 5-15 years. At least 25 sources are cited in the original articles and at least 50 in the reviews. At the same time, more than 50% of the cited papers should be printed over the past 5 years. The list is compiled according to the rules for compiling bibliographic references (authors' bibliography), taking into account the "Uniform Requirements for Manuscripts Submitted to Biomedical Journals" manuscripts submitted to the biomedical journals (see Appendix).

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Example: Surgical correction of the curved nasal septum (CNS), or septoplasty, is one of the most common rhinosurgical operations. Nosebleeds, nasal septum hematoma, acute rhinosinusitis and pain syndrome are considered the most frequent complications after septoplasty [1, 2]. Septoplasty consists of the muco-suprachondral and/or muco-periosteal leaves separation and curved areas of the cartilaginous and/or bony parts of the nasal septum removal. As a rule, smooth sections of the extracted cartilaginous part of the nasal septum are placed back between the two leaves of the epiglottis. At the same time, the nasal cavity is tamponed after surgery to avoid complications [2].

2. Material and methods

The study involved 160 3rd year students of the Medical Institute of Federal State Budgetary Educational Institution of Higher Education «National Research Ogarev Mordovia State University», divided into four groups according to the type of higher nervous activity (HNA), based on the indicators «Extraversion/Introversion» and «Neuroticism» determined on the Eysenck scale: group 1 (n=43) - high level of extraversion, low level - neuroticism, group 2 (n=35) - high level of extraversion, high level - neuroticism, group 3 (n=49) - high level of introversion, high level - neuroticism, group 4 (n=33) - high level of introversion, low level - neuroticism.

All groups were comparable in age composition, the average age in the groups was 20,12±0,19 years. Students underwent a survey conducted in 3 stages, under different conditions of basic study load and stress level (stage 1 - in the middle of the semester, stage 2 - during the session and stage 3 - after the session). The gender distribution is characterized by the predominance of women in all groups (in group 1 – 39.50% (17) men and 60,50% (26) women, in group 2 – 14,29% (5) men and 85,71% (30) women, in group 3 – 10,20% (5) men and 89,80% (44) women and in group 4 – 30,30% (20) men and 69,70% (23) women).

Spielberger's State-Trait Personality Inventory was used to assess emotional states. Indicators of attention were assessed according to the method "Proofreading test" in the letter version.

To assess the level of short-term memory, online tests "memory for numbers" and "memory for images" were used. Using traditional methods, anthropometric data of students were assessed: weight, height, blood pressure, heart rate. To determine the level of asthenia, a Multidimensional Fatigue Inventory (MFI-20) was used.

The obtained data were processed by methods of medical statistics (assessment of the normality of the distribution, parametric t-test, Mann–Whitney U test, $\chi 2$ – for assessing the distribution of relative values, r – correlation coefficient; descriptive statistics with calculation of mean values and confidence intervals). The differences were considered reliable with a probability of an error-free forecast of more than 95% ($p<0.05$).

3. Results and discussion

The study of asthenia indicators depending on the type of HNA in young people was carried out at the third stage of the study after a period of intense intellectual load. The following results were obtained. In all groups, after a period of intense intellectual load, average indicators of asthenia were recorded, exceeding the reference values of the physiological norm. The determination of the total percentage of asthenia showed its maximum value in group 3 (59,07±4,57), which indicates the presence of severe asthenia, and the minimum in group 1 (35,19±4,00), which indicates the presence of moderate asthenia. The use of a scoring system for assessing general asthenia showed that its maximum value was also determined in group 3 (16,88±1,64), and the minimum in group 4 (10,41±0,75). It was revealed that the value of this indicator was significantly lower in group 4 compared to groups 2 and 3 by 27,19% and 62,15%, respectively ($p<0.05$). It should be noted that groups 1 and 4 were characterized by a low level of neuroticism, which probably increases the student's stress resistance during a period of high intellectual stress and reduces the likelihood of developing asthenia.

The study of the indicator of reduced activity revealed that its maximum value was determined in group 3 (17,92±2,32), and the minimum in group 4 (9,95±0,79). In addition, it was determined that the value of this indicator is significantly higher in group 3 compared to groups 2 and 4 by 39,62% and 44,48%, respectively ($p<0,05$).

The definition of the indicator of reduced motivation showed that its maximum value is observed in group 1 (13,26±2,44), and the minimum in group 4 (8,55±0,69). It was also revealed that the value of this indicator was significantly higher in group 3 compared to groups 2 and 4 by 31,03% and 41,03%, respectively ($p<0,05$).

Evaluation of the indicator of physical asthenia revealed the following patterns: its maximum value is observed in group 3 (17,36±2,18), and the minimum in group 4 (8,09±0,59); The value of this indicator is significantly lower in group 4 compared to groups 1, 2 and 3 by 26,58%, 70,70% and 114,59%, respectively, and in group 3 it is significantly higher than in group 2 by 41,07% ($p<0,05$).

The study of the indicator of mental asthenia showed that its maximum value is observed in the 3rd group (14,58±2,01), and the minimum in the 4th group (8,09±0,77); The value of this indicator is significantly lower in the 4th group compared to the 1st and 3rd groups by 62,05% and 80,10%, respectively, and in the 3rd group it is significantly higher than in the 2nd group by 32,19% ($p<0,05$) (Figure 1).

Thus, the greatest severity of asthenia was observed in respondents with a high level of neuroticism (group 3), and the lowest in persons with a low level of neuroticism (group 4). The level of extra-/introversion was less important in the formation of asthenia. The data obtained were confirmed by correlation analysis. In addition, it was found that in females, a high level of neuroticism and asthenia are significantly more common, which was also noted by Royston AP, Rai M and others [3].

The main idea of the study was to determine the emotional, cognitive and physiological characteristics in individuals with a high level of neuroticism to determine the most significant factors in the formation of asthenia in a situation of stress.

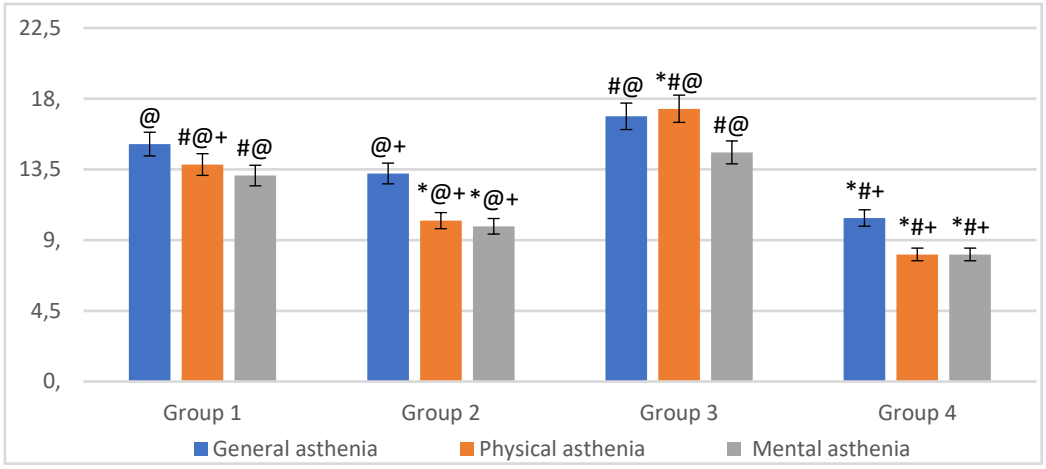

Figure 1. Indicators of general, physical and mental asthenia in young people with different types of HNA (hereinafter: * - the significance of the difference from group 1; # - the significance of the difference from group 2; + - the significance of the difference from group 3; @ - the significance of the difference from group 4; the statistical significance of the differences at p<0.05)

The study of anthropometric parameters showed some differences in height and weight indicators between groups, which is determined by the sexual heterogeneity of the groups. The estimated sample corresponded to the classical ideas about the anthropometric differences between female and male organisms.

A study of the mass index (BMI) showed higher values of this parameter in group 1 compared to group 3 by 8,73% (p<0,05). The highest index values were found in groups 1 and 4 (23,82±1,2 and 23,25±0,8 kg/m2, respectively), which is associated with a large number of men in these groups; The smallest – in groups 3 and 2 (21,74±1,0 and 21,78±0,9 kg/m2, respectively) – the greater number of women in these groups.

In the study group of young people, overweight was significantly more often noted in males. This indicator did not change in the dynamics of the study.

The determination of the duration of sleep demonstrated a slight lengthening of sleep at the second stage of the study (during the session) relative to the first in all groups, regardless of the characteristics of HNA. At the same time, sleep duration differed between groups: at the first stage of the study (in the middle of the semester), in group 1, sleep duration was longer compared to group 3 by 6,72% (p<0,05); At the second stage (during the session), there was a significant predominance of sleep duration in group 1 compared to group 2 by 16,06% (p<0,05), a longer sleep duration in group 1 compared to group 3 by 9,26% (p<0,05) and in group 4 compared to group 2 by 14,20% (p<0,05).

The study of the functional features of the cardiovascular system and its regulation showed significant differences in the studied characteristics in the groups.

The definition of the Kerdo Vegetative Index showed showed its maximum mean in group 2 and the minimum in group 4. Thus, in group 2, its value was significantly higher compared to groups 1, 3 and 4 by 48.83%, 49.66% and 71.25%, respectively (p<0.05), which is associated with the predominance of persons with predominant sympathetic influences in group 2. The percentage distribution of individuals with a predominance of activity of various parts of the autonomic nervous system is presented in Figure 2.

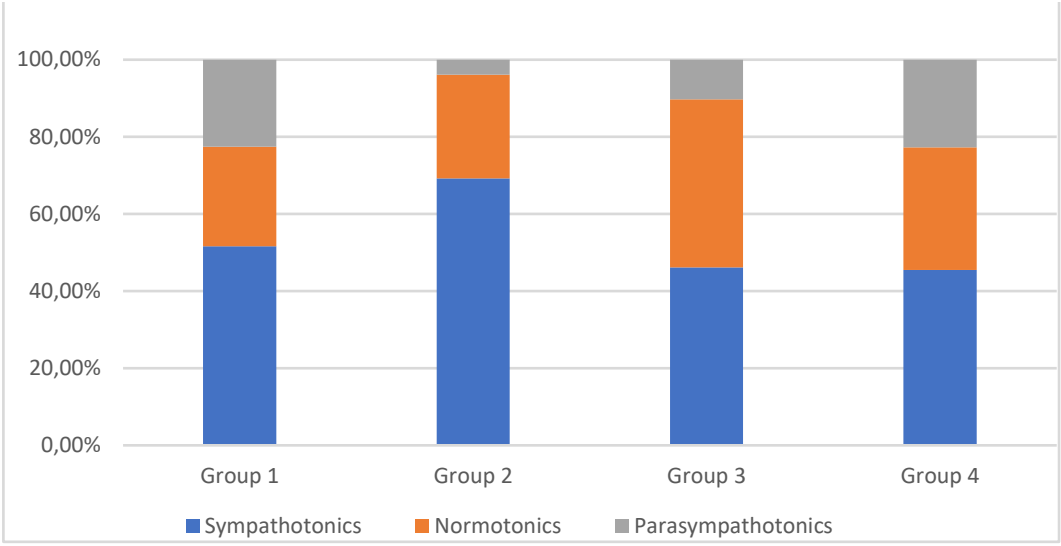

Figure 2. Percentage distribution of individuals with a predominance of activity of various parts of the autonomic nervous system

Measurement of systolic blood pressure (SBP) in the respondents of the study groups showed a normal average value of this indicator, however, in group 2 this indicator was significantly higher than in group 1 by 4,18% and comparable to group 3. It should be noted that groups 2 and 3 are characterized by a high level of neuroticism, which is probably due to the predominance of excitation processes in the central nervous system.

The determination of diastolic blood pressure (DBP) in the respondents of the study groups also revealed slight fluctuations in the values in all groups within the reference figures.

The calculation of pulse pressure (PP) showed its highest value in group 4, and the lowest in group 2. Thus, in group 4, its value is significantly higher compared to groups 1, 2 and 3 by 14,90%, 30,64% and 12,20%, respectively ($p<0,05$).

A study of cognitive functions showed the following results. The study of the volume of short-term memory did not reveal significant differences between the groups and dependence on the type of higher nervous activity at stage 1 (in the middle of the semester at the basic level of study load). The average value of short-term memory in all groups ranged from 86,31±2,13% to 89,06±1,97% of the amount of information provided.

At the second stage of the study, during the period of intense intellectual load (session), significant differences in the volume of short-term memory were revealed - the highest values were determined in groups 2 and 4 (87,75% and 84,27%, respectively), and the lowest indicator in group 3 (68,42%). When comparing the data of stages 1 and 2, a decrease in the amount of short-term memory in groups 1 and 3 by 10,38% and 21,56% ($p<0,05$), respectively, was revealed, as well as a slight increase in this indicator in group 2. It should be noted that individuals with high levels of introversion and neuroticism (group 3) are the least stress-resistant, which is probably reflected in a decrease in short-term memory during stress.

When assessing the indicators of attention, it was determined that the indicators of speed (productivity) of attention and accuracy of work (the third option, according to Whipp) were the same in all groups of respondents (there are no statistically significant differences) - the average values in all groups were from 4,13±0,23 c.u. to 4,61±0,17 c.u. and from 0,83±0,04 c.u. to 0,89±0,03 c.u., respectively. The study of the work accuracy index for the first and second options revealed a significant predominance of the index in group 1 compared to group 2 by 13,78% and 18,49% ($p<0,05$), respectively. Both groups are characterized by extroversion, but the level of neuroticism in the first group is significantly lower than in the second, which probably affects the accuracy of the work. This factor also showed its significance in the study of the coefficient of mental productivity, it was found that its value was significantly higher in group 1 compared to group 2 by 27,10% ($p<0,05$). Determination of the indicators of the volume of visual information and the speed of information processing revealed a significant predominance of these indicators in group 1 compared to group 2 by 11,38% and 18,36%, respectively ($p<0,05$). In groups 4 and 3, differing in the introversion of the respondents, the value of these indicators is approximately the same, which indicates the influence of the neuroticism index on the characteristics of attention only in conjunction with extra/introversion.

A study of procrastination at the first stage of the study revealed that its indicators were the same in all groups of respondents. Their average values in all groups ranged from 49,37±0,71% to 51,29±0,67%, which indicates a low level of procrastination in all groups.

The study of emotional balance revealed the conjugation of the dynamics of its indicators in different periods of intellectual load with the peculiarities of the HNA of young people. When assessing the respondents' reactive states, such as interest, aggression, anxiety and depression at different stages of the study at different levels of load, the following patterns were revealed: at the first stage of the study, respondents of groups 1 and 4 (with a low level of neuroticism) showed a higher level of interest than subjects from groups 2 and 3 (with a high level of neuroticism). The lowest value of this indicator was found in group 3 (19,04±0,78). Dynamic observation showed a decrease in the indicator of interest during the session in groups 1, 3 and 4 with its increase in group 2 by 8,41%.

Evaluation of the aggression indicator revealed that at the first stage of the study, respondents in groups 1 and 4 showed a lower level of aggression than those in groups 2 and 3. The highest level of this indicator was found in group 2 (14,37±1,24). The change in the dynamics by stages is characterized by a decrease in this indicator during the period of intense intellectual load and stress in groups 1 by 2,34%, 3 by 13,30% and 4 by 5,64% and its increase in group 2 by 7,83%.

The study of the anxiety indicator showed the following patterns: at the first stage of the study, respondents in groups 2 and 3 showed a higher level of anxiety than those belonging to groups 1 and 4. The highest level of this indicator was determined in group 3 (21,49±1,14). Dynamic observation showed a decrease in this indicator during the session in groups 1 – by 12,48% and 4 – by 12,83%, with a slight increase in groups 2 and 3.

When determining the depression index, its maximum level was found in group 3 (17,31±0,87). At stage 1 of the study, at the baseline level of study load, respondents in groups 1 and 4 demonstrated a significantly lower level of depression than those assigned to group 3 by 29,39% and 23,75%, respectively.

During the second stage, with an increased level of stress and stress, the difference in the depression index in the ratio of groups 1 and 4 to group 3 increased and amounted to 47,10% and 53,62%, respectively ($p<0,05$). This indicator remained the highest in the 3rd group (18,02±1,14). Dynamic observation showed a decrease in this indicator during the session in the 1st group by 9,14% ($p<0,05$), the 4th – by 19,35% ($p<0,05$) and its increase in the 3rd group by 4,16%. (Figure 3).

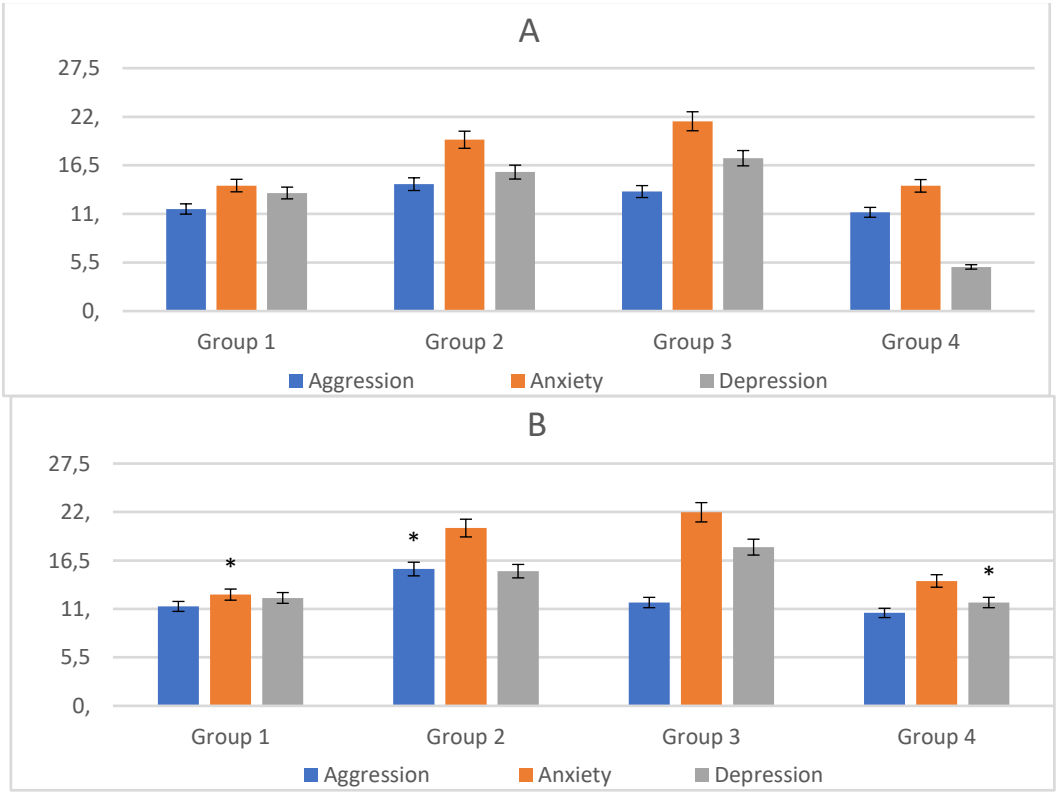

Figure 3. Indicators of aggression, anxiety, depression in young people with different types of GNI (A - during the period of basic intellectual load, B - during the period of intense intellectual load; * - the reliability of the difference between the observation periods at $p<0,05$)

Evaluation of individual personality characteristics, such as curiosity, aggressiveness, anxiety and depression, revealed generally similar patterns in the dynamics of these indicators and their differences between groups, as in similar reactive states.

Our data are consistent with the results of other researchers that an increase in depression and depressiveness during the session correlated with an increase in the level of asthenia, which was also noted in the study by Kraaij V, Bik J, Garnefski N. [3] and Milrad SF, Hall DL and others. [4,5] It was found that individuals with a high level of introversion and neuroticism are characterized by a high level of anxiety and depression, which was also established in the study by Shirahama M, Terao T et al. [6]

The calculation of the emotional balance indicator for groups of reactive states showed the following relationships: the emotional balance in terms of interest was approximately the same in all study groups at the first stage of the study (no statistical significance was revealed) - its average value ranged from 0,75±0,03 to 0,84±0,03 c.u. Dynamic observations revealed a decrease in this indicator in group 3 by 10,14% and an increase in group 2 by 8,54%. Interest characterizes the student's motivation for learning activities, a decrease in motivation during the period of knowledge control may indicate a maladaptation of mental processes against the background of stress.

The study of emotional balance in terms of aggressiveness both in the middle of the semester and during the session did not reveal significant differences between the groups. In general, this indicator was less than 1, which can be characterized as lower indicators of the reactive state relative to the basic characteristics of the individual, which indicates adequate psycho-emotional adaptation to the educational process.

The determination of emotional balance by the anxiety indicator also revealed that it was approximately the same in all study groups at the first stage of the study (no statistical significance was revealed) - its average value ranged from 1,11±0,05 to 1,19±0,06 c.u. Regardless of the period of the study, young people showed an increased value of this indicator as a reactive state, which indicates a certain level of stress even during a period of moderate academic load. Similar results were obtained in determining emotional balance in terms of depression.

5. Conclusions

Our results have revealed a direct correlation between asthenia and the level of neuroticism in young people. Asthenia is significantly more common in females. The level of asthenia does not depend on the predominance of the tone of various parts of the autonomic nervous system in the regulation of the cardiovascular system, but in individuals with a high level of neuroticism, the predominance of sympathetic adrenal influences is more often recorded. In persons with a high level of neuroticism during the period of intense intellectual stress, there is a maladaptation of mental processes, which is associated with a decrease in cognitive functions and an increase in emotional instability and correlates with the severity of asthenia after exercise.

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Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Conflicts of Interest: The authors declare no conflict of interest.

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