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Application of Mathematical Analysis for the Diagnosis of Borderline Mental Disorders in Medical Students

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Relevance. Strengthening the mental and physical health of students is one of the priority tasks of modern medicine [2]. Clinical and epidemiological studies of recent years show an increase in the growth of borderline mental disorders (PPR) in various population groups, including among university students [1,4]. The main core of PPR consists of psychogenic ally conditioned neurotic states and reactions presented in the ICD–10 mainly in section F-4 "Neurotic, stress-related and somatoform disorders". Due to the specific features of adolescence and educational activities (information overload, exam stress), students are most susceptible to PPR, in particular, neurotic states. The growth of neurotic states poses the task of organizing new forms of identifying mental disorders and their therapy. Great importance is attached to the development of methods for early detection of PPR-psychological screening, automated diagnostics [1,5,11], which allow timely initiation of psycho correction and therapeutic measures.

There is contradictory information in the literature about the frequency and structure of neurotic disorders in the student environment, the values of various factors in the formation of PPR [7-10, 12,13]. In the situation of reforming higher education, issues related to mental disorders in medical students remain poorly studied, there are no works devoted to the development of programs for early detection of neurotic disorders. All of the above shows the relevance of the task of identifying informative signs for screening PPR in students.

The aim of the work was a mathematical analysis of neuroticism indicators in students of the medical academy and the identification of the most informative personal–psychological and clinical indicators that allow classifying the initial sample of signs as healthy, pre-neurotic states (PNS) and borderline mental disorders.

Materials and methods. The material for this study was the data of psychological screening and clinical and psychopathological examination of 700 students of the II and V courses of the Medical Faculty of the Voronezh State Medical Academy. The age of the subjects was 18-25 years, among them there were men (27.3%) and women (72.7%). The survey of students was conducted in the inter-sessional period by a continuous method in the process of teaching the subjects of psychology and psychiatry at the Department of Psychiatry. At the first stage of the work, a psychological screening was conducted, as a result of which 460 students were identified with neurotic symptoms – asthenia, sub depression, anxiety. To determine neurotic symptoms, standardized scales were used – asthenia(SHAS), Tsung depression, Spielberger–Hanin anxiety. Along with these tests, Smishek's personal questionnaire, a method for measuring the level of social frustration by L. I. Wasserman and a questionnaire developed for the purposes of the study were used. At the second stage of the work, all students who have neurotic symptoms according to the results of screening underwent a dynamic clinical and psychopathological examination (conversation, observation, physical examination) at intervals of a week. As a result of a clinical examination, the diagnosis of PPR was established in 70 students. In the remaining 390 cases, the diagnosis of PPR was rejected. In this group, short-term psychogenic or somatogenic (residual effects of acute respiratory infections, bronchitis) symptoms of a borderline level in some students (195 cases) were regarded as" normal adaptive reactions "(hereinafter referred to as"healthy"). In another part of the students (195 cases), individual asthenic, somato-vegetative or anxiety symptoms persisted for a week, did not develop into a distinct syndrome complex and did not significantly affect educational activities and social adaptation. The condition of these students was regarded as "pre-neurotic".

In accordance with the stated purpose of the study, the screening indicators of 460 students who had neurotic symptoms were subjected to mathematical processing. The results of testing and questionnaires (a total of 94 parameters for each case) were analyzed using correlation [6] and cluster [3] analyses implemented in the SPSS17 application software package.

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Results and discussion. Using correlation analysis, it was found that the studied signs correlate with each other at the significance level of 0.05, and 0.01, that is, they are not independent and there is a connection between the signs and the student's condition. Based on the conducted correlation analysis, it can be argued that it is possible to distinguish three classes from a set of objects corresponding to the diagnosed groups of students. However, there are no informative indicators that determine the pre-neurotic state, therefore, the accuracy of its classification will be low.

For initial processing, signs were selected that have a correlation coefficient with the student's condition above 0.6. According to the results of the analysis, a group of healthy students has a positive correlation (r value≥0.6) with An34 (self-satisfaction at the moment), and a negative one with ID (depression index) and Ast15 (it's easy to hurt me). Preneurotic states have a weak positive relationship with the signs of An37 (often visited by anxious thoughts), Ast5 (I experience muscle weakness), An39 (at the moment, the most significant issues of professional self-determination) and a negative one with Tr (reactive anxiety). The values of the correlation coefficient modulo lie in the range of 0.35-0.41.

The closeness of the connection with PPR increases from sign to sign, starting with a value of 0.603 for Ast8 (I feel tired), Ast4 (waiting makes me nervous) to Ast2 (I find it difficult to concentrate), Ast25 (life for me is connected with tension). The closest association of PPR (r≥0.75) is observed (in order of increasing the value of r from 0.764 to 0.906) with F14 (satisfaction with relationships with friends) to Iast (asthenia index).

Based on the correlation analysis, for further classification of observations into groups of healthy, pre-neurotic state, PPR, it is necessary to use signs that have the closest possible connection (r≥0.6) with these groups. Since most of the features selected by the correlation analysis correlate with PPR, it can be assumed that the accuracy of the classification of borderline mental disorder will be maximum. The minimum values of r were obtained for the PNS, so the accuracy of its classification will be the lowest. Thus, the classification system of features consisted of 22 most informative features.

Taking into account the fact that the compiled system included signs that have both categorical and continuous values (IF - the frustration index, Iast - the asthenia index, ID - the depression index, Tr – reactive anxiety, Tl – personal anxiety, TO – general anxiety), this feature of the initial data was taken into account when choosing the classification method. The two-stage cluster analysis implemented in the SPSS17 package allows us to classify observations described by both categorical and continuous observations. Moreover, the analysis can be performed in two versions – with automatic and with forced determination of the number of clusters.

As a result of automatic partitioning, 2 clusters were obtained. The first category included healthy and preneurotic conditions, the second – PPR. At the same time, 34 cases (7.4%) were not classified. They included 23 (5%) cases from the PNS group, and 11 (2.4%) – from the PPR group. The accuracy of the classification of the PPR group was 59 people (84.3%). The results of the partitioning were found unsatisfactory.

As a result of the classification with the forced assignment of the number of clusters (3), 269 (58.5%) cases were correctly allocated into groups. Moreover, the accuracy of determining objects from the healthy group was 117 people (60%), from the PNS group 105 (53.8%), from the PPR group 47 (67.2%). As before, 34 (7.4%) cases were not classified. Overdiagnosis was 79 people (17.2%), and 67 (14.6%) of them were mistakenly attributed from the healthy group to the PNS group, and 12 (2.6%) from the PNS group to the PNR group. Thus, the forced setting of the number of clusters worsened the classification results.

It is obvious that the combination of observations from the healthy and PNS groups into one cluster occurs due to the absence of specific predictors of the preneurotic state group. Improving the accuracy of the classification of the PNS group is possible by adding new features to the diagnostic system that are not considered in this paper.An increase in the accuracy of the classification of the PPR group is possible due to the compilation of a diagnostic system only from signs with the maximum closeness of connection with a neurotic state ($r \geq 0.75$).

Thus, the next stage of classification was carried out on the basis of 7 features. The method of two-stage cluster analysis with automatic selection of the number of clusters was still used. As a result, all observations were classified into two clusters (Table. 2), the first of which was made up of observations of the group of healthy and pre – neurotic states, and the second-PPR. Moreover, the latter are determined with 100% accuracy.

If we do not set the goal of separating pre-neurotic states into a separate group, then we can talk about 100% classification accuracy. However, for the task of identifying PNS, we have 195 (42.4%) cases of underdiagnosis – the erroneous attribution of objects of the group preneurotic states to the class of healthy ones.

To isolate the objects of the PNS group into a separate cluster, specific predictors of healthy and PNS were added to the last considered system of signs.

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Thus, the diagnostic system consisted of 14 signs: F14 (satisfaction with relationships with friends), Ast29 (when I worry, I get covered in sweat), F20 (satisfaction with my lifestyle), IF (frustration index), F7 (satisfaction with my position in society), To (general anxiety), Iast (asthenia index), An34 (satisfaction with myself at the moment), ID (depression index), Ast15 (it's easy to hurt me), An30 (restless thoughts keep me awake), Tr (reactive alarm). Moreover, the last 7 features have a small information capacity (r has a value from 0.3 to 0.7 modulo). As a result of a two-stage cluster analysis with a forced task of splitting into 3 clusters, a classification accuracy of 77.2% was obtained (Table 2). 22 (4.8%) observations were not classified: 11 (2.4%) from the PNS group, 11 (2.4%) from the PPR group. All objects of the healthy group were classified correctly. Only 101 (51.8%) cases from the preneurotic condition group were included in the PNS cluster. The remaining 83 (42.6%) cases were mistakenly attributed to the healthy group. That is, the results of the PPR classification have worsened compared to the previous stage, and the PNS have improved.

Optimal from the point of view of the accuracy of the classification of PPR, it is necessary to recognize the division of the existing sample into two clusters: "Healthy and PNS" and PPR. This will allow you to select a group of students with a PPR with 100% accuracy.

The task of distinguishing preneurotic conditions from the group "Healthy and PNS" should be solved by a doctor based on the analysis of clinical symptoms and dynamic observation. The PPR group is characterized by increased average values of the frustration index, general anxiety and asthenic index. When assessing the asthenic state and social frustration, it was found that the frequency of negative responses in the PPR group exceeds the similar frequency in the "Healthy and PNS"group.

Conclusions. The results of correlation and cluster analysis of neurotization factors in students of the medical Academy showed the following:

1. Reliable diagnosis of the conditions of students with neurotic symptoms is possible for two groups "Healthy and pre-neurotic states" and borderline mental disorders. It is shown that in this case, the accuracy of the PPR classification is 100%.

2. A complex of informative signs has been identified that allows diagnosing borderline mental disorders in students in an automated mode with a high degree of accuracy: the frustration index, general anxiety, asthenic index, increased sweating during excitement, dissatisfaction with their position in society, relationships with friends, closest acquaintances, their lifestyle in general.

List of sources used:

1. Alexandrovsky Yu. A. Borderline mental disorders. - M.: Medicine, 2000. - 469 p.
2. Dmitrieva T. B. New directions of social psychiatry in the system of improving the protection of public mental health// Mater. XIV Congress of Psychiatrists of Russia. - M., 2005. - pp. 50-51.
3. Zhambyu M. Hierarchical cluster-analysis and correspondence. - M.: Finance and statistics, 1988 – - 342 p.
4. On the problem of the prevalence and detectability of mental disorders / T. V. Zozulya, V. T. Rotstein, A. N. Slutsky/ / Journal of Neurology. and a psychiatrist. - 1994. - Vol. 94, No. 4. - pp. 99-103.
5. Quality of life and neuropsychiatric disorders/ I. E. Kupriyanova, V. Ya. Semke.- Tomsk: Tomsk Publishing House. un-ta, 2006 – - 100 p.
6. Kramer G. Mathematical methods of statistics. - M.: Mir, 1975 – - 648 p.
7. Lavrentieva N. A. Identification of the level of neuroticism and impaired adaptation to the educational process among students of the Voronezh State Medical Academy// Problems of health saving of schoolchildren and students. New scientific trends in medicine and pharmacy: mater. inter-region. scientific.- prakt. jubilee. conf. - Voronezh, 2008. - pp. 352-354.
8. Murashov A.V. To the study of neurological disorders in students/ / Healthcare of the Russian Federation. - 1991. - No. 1. - p. 29.
9. Ulezko A.V. The prevalence and structure of borderline neuropsychiatric disorders in teams with different working conditions and activity profile// Proceedings of the Astrakhan State Medical Academy. - Astrakhan, 1996. - Vol. 1 (25). - p. 161-181.
10. Clinical and dynamic features of the formation of borderline mental disorders in young students/ A. A. Churkin, A.V. Beresnev// A Russian psychiatrist. journal. - 2003. - No. 5. - pp. 21-24.

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11. On the issue of mental health protection in the primary medical network/ A. A. Churkin, O. B. Blagovidova, L. M. Zhitnikova// A Russian psychiatrist. journal-2009. - No. 1. - pp. 19-23.
12. Stress and depressive symptoms / dysphoria among US medical students: results from a large, nationally representative survey/ M. T. Comton, Y. Carrera, E. Frank/ / Gig. Sanit. – 2008. – Vol. 4. – P. 66-69.
13. Prevalence of DSM-IV major depression among Spanish university students/ F.L. Vazquer, V. Blanco// Nurs Forum. – 2008. – Vol. 43, №4. – P. 238-246.

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