

Information technologies in processing psychological experiments

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Abstract. The article discusses the possibilities of using the methods of mathematical statistics and the use of computer programs for collecting information about the respondent and processing the results of psychological research. The use of computerized survey systems really saves the psychologist's time when conducting thematic tests with large groups of respondents, eliminates the likelihood of errors in processing the results. At the same time, long-term storage of information is possible, and when conducting similar studies after a significant period of time, it allows one to compare the results and draw appropriate conclusions about the effectiveness of the psychological measures taken. The set of developed software includes thematic tests, divided into separate questionnaire programs for the relevant sections of the psychological research. Each program includes not only tests, but also a system for their processing, with the issuance of results. The use of different tests on the same topic allows you to comprehensively assess the situation under consideration. At present, the software package is being successfully tested when testing specialists from fire and rescue centers and disaster medicine services. The results of computer tests are used by psychologists to work to prevent professional deformations among emergency services specialists. As an example, the article presents a computer program for assessing the manifestations of professional burnout among specialists of the Disaster Medicine Service of different age groups on the basis of tests interpreted by N.Ye. Vodopyanova, V.V. Boyko, V.A. Doskin and G. Eysenck. In addition, when analyzing test results, methods of processing mathematical statistics (Fisher's angular transformation or Student's t test) are used.

Keywords: psychological research, computer program, professional burnout, disaster medicine service, data processing, testing, software.

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1 Introduction

One of the features of modern scientific research in psychology is the informational approach, which assumes that the conclusions obtained in the study should be based on objective information. In turn, the objectivity of the information received depends not only on the adequacy and reliability of the psychological methods used in the study, but also on the methods of mathematical processing of the information obtained by the researcher. The use in psychological research of methods of mathematical statistics and computer programs for processing the results obtained significantly increases the reliability of the conclusions. Next, we will consider the experience of using mathematical and statistical methods in a study aimed at identifying differences in the manifestations of professional burnout in medical workers providing emergency medical care within the Disaster Medicine Service (DMS) unit.

The content of professional tasks that a DMS employee solves in an emergency occurs in conditions of increased risk and high responsibility for people's lives. Accordingly, the peculiarities of the professional activities of medical workers of the Disaster Medicine Service create constant chronic tension and have a strong psycho-traumatic effect on the personality of a specialist, amplified by the action of stress factors in an emergency. Such activity creates a high risk of such a phenomenon as professional burnout among medical personnel. For testing, the program "Professional burnout" was used, which is included in the software package, according to the assessment of professional deformations.

Initially, testing in the approbation mode was carried out on students of the "Technosphere Safety" direction with a profile "Protection in Emergency Situations". Naturally, in this case, far from all tests were tested, but only those related to personality traits [1-4], creativity [5-7] and ethno-national attitudes, interethnic attitudes and patriotism among students [8-9]. Personogenesis, in this case, was considered as a system of five qualitatively unique births of a personality [10].

The aim of the study was to study the professional burnout in medical workers providing emergency medical care. It was suggested that there are statistically significant differences in burnout symptoms among disaster medicine medical workers depending on age.

The study involved employees of the Disaster Medicine Service who provide emergency medical assistance to victims in various emergency situations (accidents, disasters, natural disasters, terrorist attacks, etc.). The sample included medical specialists aged 28 to 52 years. For the purposes of the study, the participants were divided into two groups: young professionals aged 28 to 36 years, mature employees aged 36 to 52 years.

2 Materials and methods

To study the professional burnout from the specialists of the Disaster Medicine Service, the "Professional burnout" test was used, which is the Russian version of the test by K. Maslach., S.Ye. Jackson (MBI), developed by N.E. Vodopyanova and E.S.

Starchenkova in 2003 to determine the severity of various burnout symptoms in specialists from different professional groups. The test identifies three symptoms of professional burnout: "emotional exhaustion", which characterizes a decrease in emotional tone, emotional indifference, the appearance of depressive symptoms; "Depersonalization" manifests itself in the deformation of relations with people (negativism, cynicism, conflicts, etc.); "Reduction of professional achievements" is manifested in a decrease in professional and general self-esteem, professional motivation, and a decrease in the value of their professional achievements. In accordance with the general "key", the sum of points for each factor is calculated and the level of severity of the symptom is determined: low, medium, high.

The processing of the results according to V.V. Boyko test was carried out in a similar way, test - questionnaire V.A. Doskin SAM (state of health, activity, mood) and the self-assessment test of mental states by G. Eysenck.

Since our hypothesis assumed the identification of differences between the compared groups of study participants, identified by the criterion of age, we used such a statistical method as Fisher's angular transformation (ϕ), designed to compare two samples in terms of the frequency of occurrence of the effect of interest (Figure 1).

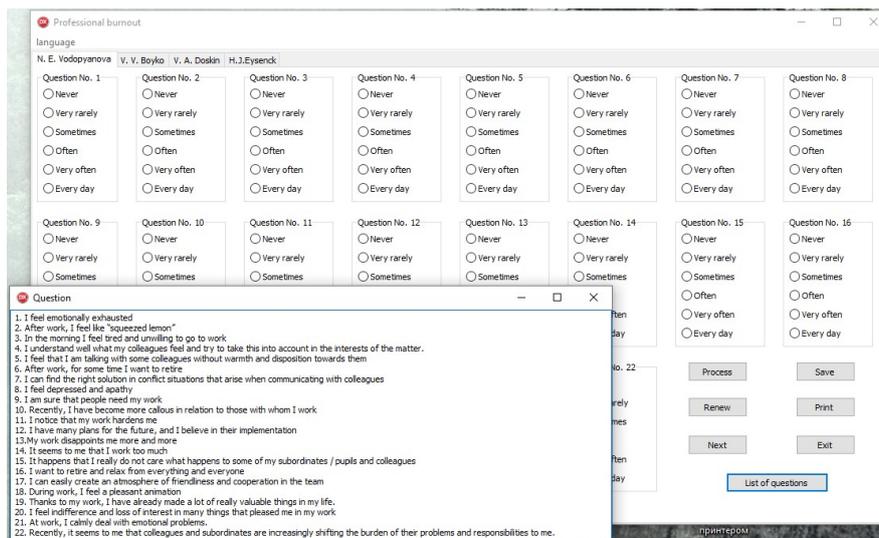


Fig. 1. Professional Burnout program interface.

3 Results

The use of a computer program during testing significantly accelerated the process of processing the results, and the use of several questionnaires made it possible to obtain expanded information about the respondents. This allowed, in the future, to adjust the psychological measures to prevent emotional professional burnout. Many researchers

note the role of age in the occurrence of professional burnout, and the data on its effect are very contradictory. Therefore, we will consider this interesting factor that can be easily tracked using a computer program in the form of the severity of burnout manifestations in two age groups: medical workers under 36 years old (45% of the study sample) and employees from 36 to 52 years old (55% of the sample). The data are given in the table taking into account the statistical method φ^* - Fisher's test in Table 1 and in Figures 2-4.

Table 1. Indicators of the severity of symptoms of professional burnout in medical workers of the DMS, depending on age, percent.

Burnout symptoms	Severity levels	Medical professionals under the age of 36	Healthcare professionals aged 36 to 52	φ_{mp}
Emotional exhaustion	High level	20	45	3.847 (significant)
	Average level	55	40	2.13 (in the zone of uncertainty)
	Low level	25	15	1,782 (in the zone of uncertainty)
Depersonalization	High level	35	10	4.398 (significant)
	Average level	45	75	4.405 (significant)
	Low level	20	15	0.933 (in the zone of insignificance)
Reduction of professional achievements	High level	15	45	4.78 * (significant)
	Average level	65	35	4.306 (significant)
	Low level	20	20	0

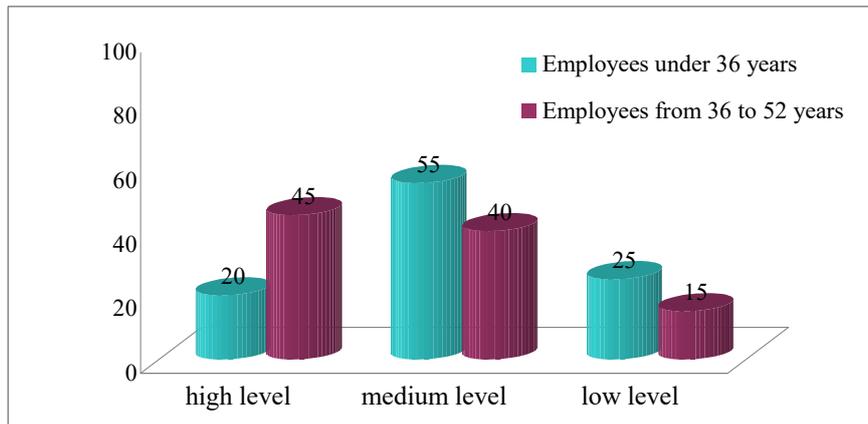


Fig. 2. Indicators of levels of emotional exhaustion of DMS employees of different age groups, percent.

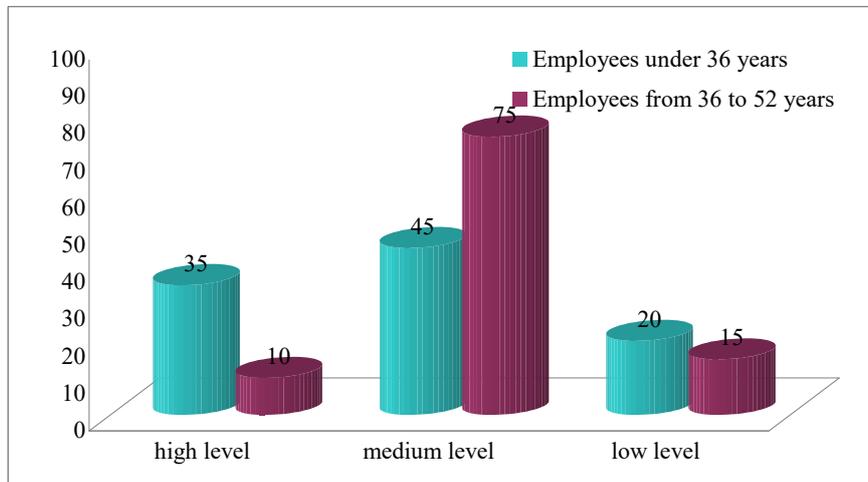


Fig. 3. Indicators of depersonalization levels among DMS employees of different age groups, percent.

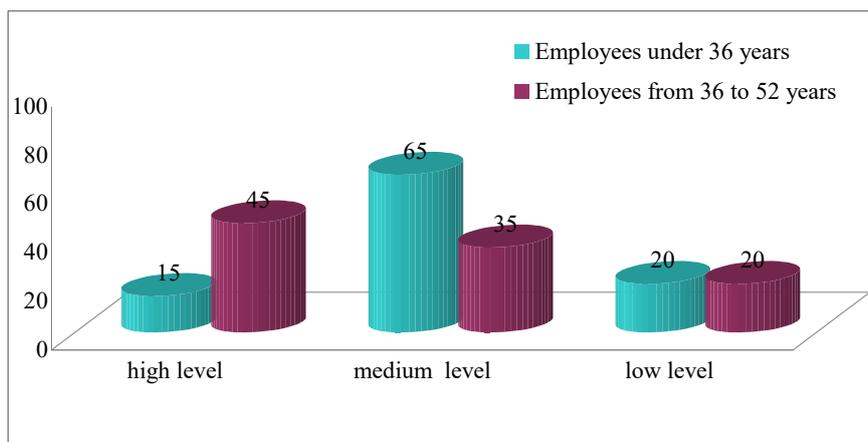


Fig. 4. Indicators of the symptom of reduction of personal achievements in DMS employees of different age groups, percent.

4 Discussion

The use of the computer program "Professional burnout" based on just one of the psychological studies related to the influence of age on occupational deformation made it possible to obtain comprehensive answers on the influence of this factor. At

the same time, the data in Table 1 show that almost half (45%) of employees in the age group from 36 to 52 years old have a high level of severity of emotional exhaustion. Among employees under 36, only 20% have this level (the differences are statistically significant). This indicates that among mature employees there are significantly more of those who are characterized by manifestations of emotional overstrain, feelings of exhaustion of emotional and energy resources.

The majority of young employees have an average level of emotional exhaustion (55%). In the group of mature medical workers, 40% have this level. Therefore, the absence of statistically significant differences in this level suggests that young and mature employees do not differ in the moderate severity of the symptom of emotional exhaustion. The smallest number of employees in both groups have a low level of emotional exhaustion (25% - in the age group up to 36 years old and 15% - in the age group from 36 to 52 years old).

Thus, it can be stated that in the age aspect, a decrease in emotional and energy resources is characteristic of more mature DMS employees. This is obviously due to the fact that with age there is a decrease in the general mental resources of the individual and, as a consequence, a decrease in resistance to the effects of various stress factors, including occupational ones.

Statistically significant differences in the severity of the symptom of depersonalization are noted for high and medium levels of severity of this symptom. A high level of depersonalization symptom is noted in the age group up to 36 years old (35%); in more mature employees, only 10% have this level. This suggests that statistically significant for one third of young medical workers are such destructive manifestations in the performance of professional duties as: negative attitude towards patients, manifested in irritability, anger, emotional detachment.

The average level of depersonalization is more pronounced among DMS employees aged 36 to 52 years (75%) compared with their young colleagues (45%) (the differences are statistically significant). Least of all in both age groups (20% and 15%) employees with a low level of this symptom of burnout.

Thus, moderate tendencies of depersonalization are manifested in DMS employees of the older age group, employees under the age of 36 tend to be more formalized and negative in relation to the subjects of professional interaction.

The symptom of a reduction in professional achievements is recorded in almost half of employees (45%) in the age group from 36 to 52 years old compared to colleagues in the younger age group (15%) (the differences are statistically significant). This result suggests that with age, medical workers have a growing tendency to decrease their job satisfaction, their professional self-realization, since the activities performed do not always provide an opportunity to achieve their goals. This is due to the specifics of medical work (even in the DMS system, the doctor is limited by the standards in providing assistance to victims, which reduces his sense of professional independence), and with insufficiently high wages for such a responsible and intense professional activity.

The majority of employees under the age of 36 (65%) have an average severity of this symptom, 35% of employees from 36 to 52 years old are characterized by a mod-

erate severity of the symptom of a decrease in the significance of their achievements in the profession.

Thus, among medical workers in the age group from 28 to 36 years old, the symptom of depersonalization is most manifested, which characterizes the deformation of professional communication (formalism, negative attitudes towards patients, colleagues).

For medical workers in the age group from 36 to 52 years old, symptoms of emotional exhaustion and reduction in professional achievements are more characteristic.

These findings support the hypothesis of this psychological study.

In a similar way, it is easy to analyze the factor of influence of age and according to the tests of V.V. Boyko, V.A. Doskin and G. Eysenck. Next, you can formulate another hypothesis and, using the program data for all four tests, construct similar diagrams and draw appropriate conclusions.

After carrying out corrective psychological measures, you can re-test on computers and compare the results. At the same time, the data obtained will make it possible to assess the effectiveness of the correction of the respondents' emotional state.

5 Conclusion

So, the use of a computer system for testing and data processing allows you to quickly receive information and, accordingly, carry out the necessary corrective measures of a psychological orientation. In the context of emergency services, where the mental health of the staff is of no less importance than the physical, timely analysis avoids serious consequences for the employee. Based on the example given in the article, it can be seen that the use of methods of mathematical data processing makes it possible to reveal statistically significant differences in the severity of symptoms of professional burnout in medical workers of the Disaster Medicine Service of different age groups. Similar studies can be conducted for other risk factors using the same survey data without having to retest.

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