

Stress Resistance in the Situation of Uncertainty as a Factor of Development of Adaptive Ability of Medical Personnel

Andriy HALIAN¹,
Ihor HALIAN²,
Ihor POPOVYCH³,
Yurii ZAVATSKYI⁴,
Oleksandr SEMENOV⁵,
Nataliia SEMENOVA⁶

¹ Ph. D. in Psychology, Doctor Pediatric Anesthesiologist of the Department of Anesthesiology and Intensive Care Lviv Regional Children's Clinical Hospital "OKHMATDYT", Lviv, Ukraine, andriyhalian@gmail.com

² Doctor of Psychological Sciences, Full Professor, Full Professor of the Department Practical Psychology, Drohobych Ivan Franko State Pedagogical University, Drohobych, Ukraine, halian@ukr.net

³ Doctor of Psychological Sciences, Full Professor, Full Professor of the Department of Psychology, Kherson State University, Kherson, Ukraine, ihorpopovych999@gmail.com

⁴ Candidate of Psychological Sciences, Associate Professor, Head of the Department of Human Health and Physical Education, Volodymyr Dahl East Ukrainian National University, Ukraine, urijzavackij3@gmail.com

⁵ Doctor of Pedagogical Sciences, Full Professor of the Department of General Pedagogy and Preschool Education, Volyn National University named after Lesia Ukrainka, Ukraine, os7284292@gmail.com

⁶ Candidate of Pedagogical Sciences, Associate Professor of the Department of Pedagogy, Volyn National University named after Lesia Ukrainka, Ukraine, os7284292@gmail.com

Abstract: *Aim. The aim of the study is to perform psychological and psychophysiological analysis of the features of stress resistance that provide adaptation of medical personnel in the situation of uncertainty. Materials and methods. The study involved: 125 students of III and IV years of study majoring in "Treatment" and "Nursing"; 95 internship doctors 2-3 years of training in various specializations. 36.84% of the total numbers of studied internship doctors were those whose specialization is characterized by an increased level of stress. Methods: correlation analysis, tests with standardized questionnaires. Result. It was found that the manifestation of open, direct aggression by respondents is an acceptable strategy of interaction, which does not significantly affect adaptability. It has been studied that hostility, as an internal directive of the personality, is often not observed externally and determines the decrease in emotional comfort and violation of adaptation. Conclusions. It is proved that adaptive activity as a system-forming factor is accompanied by a number of psychological, biological and social processes and collectively forms the stress resistance of the personality. It is indicated that the immune system is an important part of the functional systems that form the biological factor of functional diagnosis at the stage of low stress resistance and borderline disorders. It is noted that it is appropriate to use functional diagnosis as a basis for diagnosing a person's mental state in the development of stress resistance.*

Keywords: *Stress; homeostasis; immune system; functional diagnosis; adaptation.*

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1. Introduction

In a situation of instability, uncertainty, poor predictability of social processes, mental stress on a person increases (Khmliar et al., 2020; Tomaszek, & Muchacka-Cymerman, 2020). This problem is especially relevant during the pandemic “CoronaVirus” (COVID-19 disease caused by SARS-CoV-2 virus). The lack of medicaments, vaccines and generally objective information about this viral infection creates a mass psychosis of the Earth’s population, driving it to a state of hopelessness. In this situation, a matter of time is the emergence of emotional disorders, stress. The matter of person’s adaptive capabilities, their determinacy by stress resistance is actualized.

In psychology, psychophysiology, biology, medicine, stress resistance and its impact on the ability to adapt is considered from different positions. The basic nature of adaptation is revealed through the specific correlation of the multilevel properties of the integral individuality. It is believed that the consequence is biological, physiological, psychological homeostasis of the system and the optimal interaction of the subject with the environment in different living conditions (Subbotin, 1992).

The authors of the article believe that biological homeostasis is manifested through psychoneuroimmune interaction, which is a component of functional systems. The dynamics of this interaction could be an indicator of predisposition to endogenous mental disorders. However, this predisposition will depend on the constitutional and biological characteristics of the individual and the states of mental dysfunction, which, although they appear, do not reach the psychotic level.

Biological adaptation, reflecting the interplay of functional systems of metabolic, homeostasis and behavioral levels, depends on NOS non-specific changes in neuroimmune interactions. These are both innate and acquired immunity, and glioneuronal interactions in the central nervous system. The authors agree with B. Butoma that the variability of cellular, humoral immunity and sensitization reactions to neurospecific antigens characterize the stability and reactivity of the system according to the relevant indicators (Butoma, 2008). Of scientific interest is an empirical study which identifies the dynamics of adaptation resources of respondents (Blynova et al., 2020; Halian et al., 2020a; Prykhodko et al., 2020), the level of psychological security and the impact on strengthening of moral and volitional efforts (Blynova & Kruglov, 2019; Shevchenko et al., 2020a).

Today, the issue of professional stress resistance is on the agenda. However, pandemic uncertainty should shift the priority of occupational

stress research towards the medical field. The need for such research is determined by the essentiality of the medical profession. Moreover, in a pandemic situation, doctors are the first to contact patients. Their emotional stability will be the key to successful treatment of patients.

In addition, the situation of uncertainty, the lack of proper medical equipment contributes to the development of maladaptation in physicians (in the worst case – the pathogenesis of various systems). This can be expressed in various forms of aggression. Therefore, there is a need to turn to personal resources that would help tame the aggressive state and the development of stress. This explains the relevance and essentiality to study this problem.

Hypothesis

The authors assume that adaptive activity as a system-forming factor is accompanied by a number of psychological, biological and social processes, collectively forming the stress resistance of the personality.

The aim

The aim is to conduct an empirical study of psychological and biological features of stress resistance, which determines the adaptive capacity of future medical personnel in a situation of uncertainty.

2. Materials and methods

Methodological initial principles of the empirical study of adaptability and stress resistance of medical personnel are based on conceptual provisions related to the issues of adaptability and stress resistance of the personality (Shevchenko et al., 2020; Striletska, 2017; Wang et al., 2009). This methodology has been tested by researchers in the study of the theory of functional diagnosis, which is based on the adaptive-compensatory capabilities of the subject (Broker et al., 1989; Reich et al., 1975), adaptation and motivation of the specialist to professional activity (Halian, 2016; 2019; Halian et al., 2020b; 2020c), resourcefulness of medical personnel (Lunov, 2016), as well as the assessment of mental expectations in various activities (Khmil & Popovych, 2019; Popovych et al., 2020). All these experimental and empirical studies contained an element of adaptation, emotion, motivation, stress resistance, functional diagnosis.

Participants

The study involved: 125 students of III and IV years of study majoring in “Treatment” and “Nursing”; 95 internship doctors 2-3 years of

training in various specializations. 36.84% of the total numbers of studied internship doctors were those whose specialization is characterized by an increased level of stress (surgeons of various directions, anesthetists, infectiologists, and burn physicians). All subjects under study represented different regions of Ukraine. The research is conducted according to ethical standards of committee on the rights of experiments of Helsinki declaration (2013).

Organization of Research

During the academic semester, psychodiagnostic methods were used to measure the studied parameters. The test “Self-assessment of the personality stress resistance” (“SPSR”) was used to diagnose stress resistance (Shamionov, 2004). The content of the stimulant material was events related to young people receiving vocational education. The method determines the levels of stress resistance.

The indicator of adaptation was determined by “Methods of diagnostics of social and psychological adaptation” (“DSPA”) (Rogers & Daymond, 2002): adaptability – maladaptation, acceptance of oneself – non-acceptance of oneself, acceptance of others – rejection of others, emotional comfort – emotional discomfort, internal control – external control, domination – subordination, escapism, scale of openness.

The diagnostic part of the diagnostic and preventive system “Integrated diagnosis and correction of occupational stress” (“IDCOS”) was used for integrated assessment of occupational stress in respondents (Leonova, 2007). The diagnostic part of this system takes the form of a questionnaire-type psychometric test. It contains six main scales: “working conditions and organization”; “Subjective assessment of difficulties in the work situation”; “Remuneration for work / social climate”; “Experiencing acute stress”; “Experiencing chronic stress”; “Personal / behavioral deformations”. Differential and evaluative indicators of the methodology are standardized indices for all these scales and subscales. A general indicator of the test is the index “overall stress level” – a consolidated score on six main scales. The method identifies five criteria ranges: low, moderate, pronounced, high and very high stress. The indexes of reliability obtained with Cronbach’s alpha made: $\alpha_{\text{SPSR}} = 0.747$; $\alpha_{\text{DSPA}} = 0.791$; $\alpha_{\text{IDCOS}} = 0.821$. The indexes of reliability of the methods used and the tests of Cronbach’s alpha were within a sufficient 0.7 and high 0.9 levels.

Procedures

The study was organized according to the scheme of the ascertaining experiment. The obtained results were interpreted separately for each method. This was followed by a search for a causal link between the diagnosed mental phenomena. The depth of the interconnection between the individual features of the phenomenon under study was measured by correlation analysis.

Statistical Analysis

Statistical processing of empirical data and graphical presentation of results was carried out using statistical programs “SPSS” v. 26.0 and “MS Excel”. A nonparametric t-criterion Kendall was used.

3. Results

A statistically significant correlation (t-criterion Kendall) of aggressive and hostile manifestations according to the “adaptability” scale was established (see Table 1).

Table 1. *Correlation values of the indicator of adaptability and manifestations of aggression of future medical personnel*

Scale	Hostility	Irritability	Suspiciousness	Feeling of guilt
<i>Adaptability</i>	–0.205**	–0.18**	–0.214**	–0.145

Notes: * – the correlation is significant at the level $p < 0.05$ (two-way); ** – the correlation is significant at the level $p < 0.01$ (two-way).

There was a negative correlation with hostility, irritability, suspiciousness, and feeling of guilt. We state: the higher the rate of hostility, the lower the level of adaptability of students.

Correlation (t-criterion Kendall) connections of hostility with individual scales of the “DSPA” method have been established (see Table 2). There is a negative correlation between “hostility” and scales such as “acceptance of others”, “internality”, “self-acceptance”, “emotional comfort” and a positive correlation with the scale of “escapism” (escape from problems).

Table 2. *Intercorrelation of indicators of adaptability and hostility of future medical personnel*

Kendall t-criterion	Components of adaptability				
	Self- acceptance	Acceptance of others	Emotional comfort	Internality	Escapism
<i>Hostility</i>	−0.126	−0.181**	−0.199**	−0.22**	0.194**
<i>Adaptability</i>	0.481*	0.311*	0.460*	0.437*	−0.134

Notes: * – the correlation is significant at the level $p < 0.05$ (two-way); ** – the correlation is significant at the level $p < 0.01$ (two-way).

According to the results of the “SPSR” test, future medical personnel showed an average level of stress resistance (35.7 points). There is a tendency to a possible decrease in stress resistance with increasing stressful situations.

The difference in stress resistance of the respondents with different levels of adaptability is not significant. The lowest, within the average, stress resistance indicator is characteristic of respondents with a low level of adaptability, the average – with medium adaptability and the highest – in respondents with a high level of adaptability. At the same time, this correlation indicates a tendency for subjects with low stress resistance to adapt more difficult to the environment.

It is shown that internship doctors of specializations with increased level of stress resistance are inferior in all parameters of the scale (see Fig. 1).

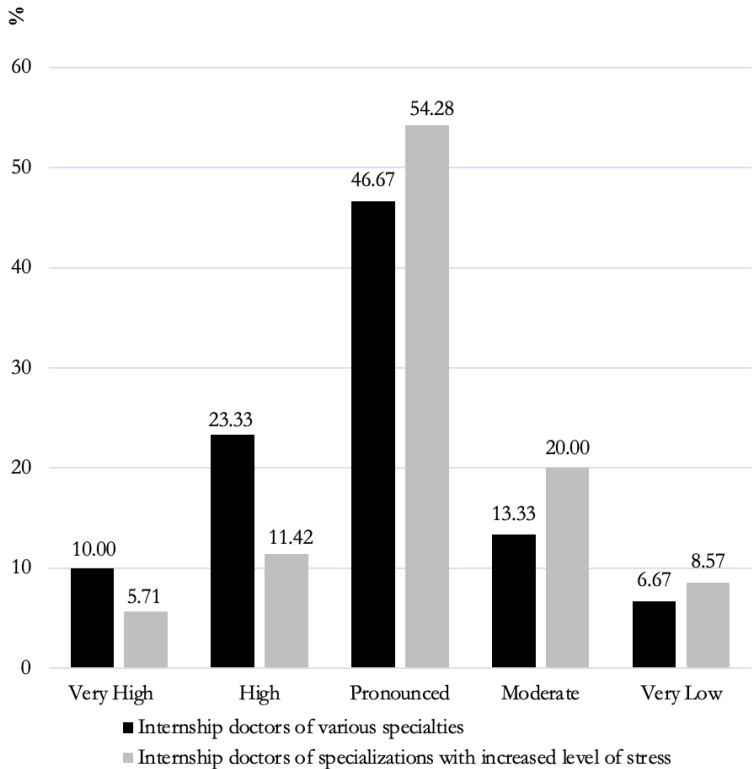


Fig. 1. *The ratio of stress resistance in physicians specializing in high and relatively low levels of stress*

According to the results of the interlocution with internship doctors of different specializations, the outcomes were obtained on the factors of stressful situations (see Fig. 2).

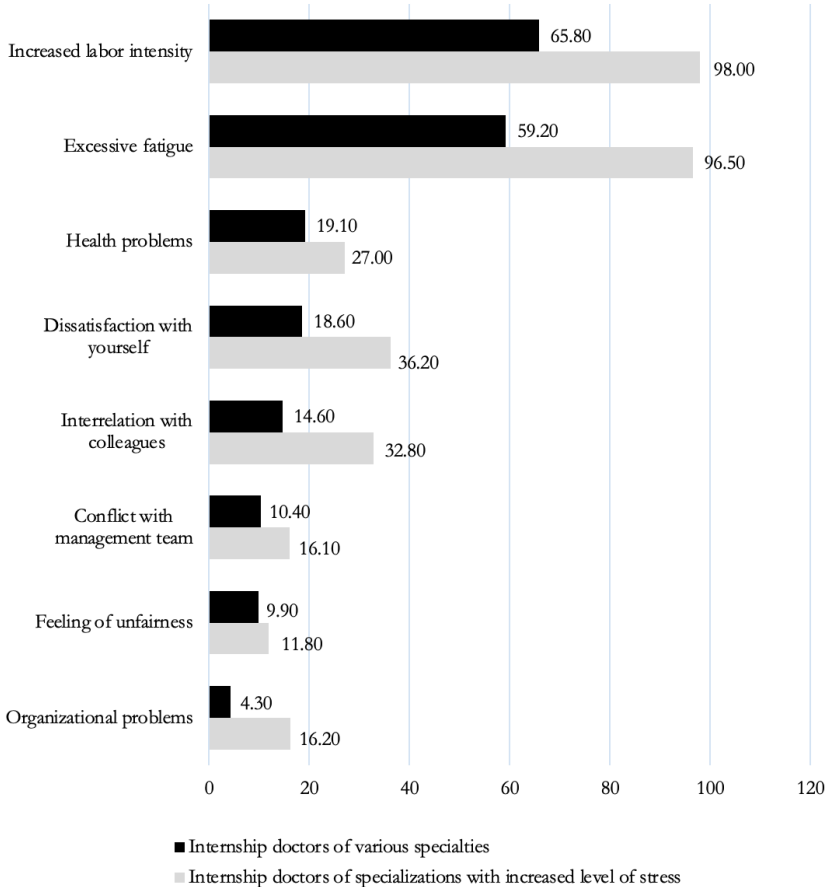


Fig. 2. *Factors that cause internship doctors anxiety and distress in the workplace*

The main cause of stress at work, internship doctors called high work intensity due to a combination of high intellectual and emotional amount of work to be done, as well as irrational mode of work and rest due to extremely high workload. Internship doctors whose specializations can be attributed to a high level of stress (future surgeons, anesthesiologists) showed significant differences in the indicators of the criteria that generate stress.

4. Discussion

There are not many studies of stress resistance of future medical personnel. It is of scientific interest to study the features of the motivational sphere of future doctors (Borysiuk et al., 2019). Another scientific study revealed the issues of psychological correction of the emotional burning out syndrome of nurses (Tanasiichuk et al., 2019). However, the study of psychological and biological factors of stress resistance and their impact on adaptive capacity in conditions of uncertainty is no less interesting.

We state the lack of influence on the adaptability of such forms of aggression as physical aggression, indirect aggression, negativism, verbal aggression, insult. The level of adaptability reduces irritability, suspiciousness, feeling of guilt and hostility.

Hostility as a setting, due to its “closeness” increases the aggression that cannot get out. Increasing hostility in respondents correlates with a decrease in the level of acceptance of others and self-acceptance, internality and emotional comfort, spontaneity in social contacts, as well as an increase in the desire to “escape” from problems, internal tension, and isolation. Ultimately, this reduces their adaptability.

In a situation of uncertainty, the operation of functional subsystems of the human organism is accompanied by shifts that go beyond the optimal functioning of the adaptation system. As a result, there is a feeling of discomfort. This suggests that no matter from which positions the mechanisms of stress are explained, the leading issues remain about nervous and endocrine regulation (Apchel & Cygan, 1999).

At the same time, the action of stressors on the body causes the reaction of all systems involved in the process of adaptation: immune (cellular and humoral immunity, specific and nonspecific), neurohumoral (sympathoadrenal, hypothalamic-pituitary-adrenal, reproductive) and adaptive (normal and pathological adaptive reactions and conditions) (Kryzhanovskij, 2000). One of the first to respond to changes in the external and internal environment of the human organism is the immune system, promoting its homeostasis. Thus, adaptive activity is a system-forming factor. Proper state of the immune system is a key factor in stress resistance.

In the process of adaptation to stress is the mobilization of: energy resources of the body to perform certain functions; plastic reserve of an organism and strengthening of adaptive synthesis of enzymatic and structural proteins; protective capabilities of the organism (Viru, 1995).

Over time, chronic stress becomes a constant companion of the doctor's work, which, according to the modern medical-physiological model, determines the violation of homeostasis. This is manifested in imbalance of adaptive forces of the organism, resulting in the appearance of a complex of changes in coordinated biochemical, neurohumoral and cellular processes, as well as immunological reactions (Kocjubinskij et al., 2005; Schnall et al., 1990). In addition, doctors can develop the so-called burning out syndrome, due to which various psychosomatic illnesses appear in the later stages of development. Such diseases are able to induce metabolic disorders in the body, including dysleptosis.

The presented considerations encourage us to find ways to reduce the stress of the external environment and increase the body's stress resistance. Observation of impaired immune homeostasis will be a leading factor in this process. In this context, it is beneficial to use functional diagnosis as a basis for diagnosing a mental condition (Urata et al., 1990). We agree with the opinion of experts that the functional diagnosis of compensatory capabilities of the personality can be represented by blocks that contain extra-nosological features: biological block of adaptive potential; psychological block of mental adaptation; social block of mental adaptation; social support block (Broker et al., 1989; Kocjubinskij et al., 2005; Luca et al., 2020; Rebegea et al., 2019; Urata et al., 1990). It will also be appropriate to study the psychophysiological mechanisms of human stress for the psychophysiological support of various activities.

Improving the individual stress resistance of both future and current health care workers should be based on a number of mandatory measures. First of all, these are career guidance measures at the stage of choosing the profession of a doctor in general, and medical specialization in particular. During the professional activity, a set of treatment and rehabilitation measures should be carried out in accordance with the actual doctors' state of health, especially with low and very low resistance to stress. Particular attention should be paid to medical personnel of the most "stressful" specializations.

5. Conclusions

1. We state that the manifestation of open, direct aggression by respondents is a fairly acceptable strategy of interaction and does not significantly affect adaptability. Hostility, as an internal directive of the personality and often not seen from the outside, determines a decrease in emotional comfort and impaired adaptation.

2. It is revealed that emotional satisfaction with the situation and its position in it can determine the feeling of pseudo-adaptation. The reason for this is the low level of reflexion and the low need to change adaptive strategies. The reason for the emergence of aggressive and hostile tendencies, among others, is the low stress resistance of the subject of professional activity, which to some extent affects the adaptability of the subject.

3. Adaptive activity as a system-forming factor is accompanied by a number of psychological, biological and social processes, collectively forming the stress resistance of the personality. The immune system is an important part of the functional systems that form the biological factor of functional diagnosis at the stage of low stress resistance and borderline disorders. It is emphasized that the use of functional diagnosis as a basis for diagnosing a person's mental state is appropriate in the work on the development of stress resistance.

4. The study of the relation between certain types of dysfunctional disorders and impaired immunological parameters can serve as a basis for a differentiated approach in the psychoprophylaxis of personality stress resistance.

The obtained results of the research contribute to the solution of the tasks of educational and professional training of future medical personnel. It is obvious that the application of research results will contribute to the effective organization of the educational process of students of this specialty. The question of identifying patterns of stress resistance formation within future medical personnel in a pandemic of infectious diseases remains open.

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