Complex psychophysiological approach to the diagnostic of anxiety and depressive states for military personnel

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The specifics of military activity under certain environmental conditions can become an indicator of hidden anxiety disorders and depressive states of the personality. Timely detection of those states in military personnel is very important for providing them with appropriate professional assistance. In Ukraine today, given the military realities, this topic is quite relevant. The presence of anxiety and depression was studied in 48 male servicemen aged 19-22 years. Psychophysiological and psychological methods were used: the Hospital Anxiety and Depression Scale and the Hamilton Anxiety Rating Scale. To assess the adaptation potential, the method of determining the index of functional changes was used, which takes into account both functional reserves and the degree of tension of homeostasis regulatory mechanisms. The predominance of a certain department of the autonomic nervous system was determined by Kerdo's Vegetative index. Ruffier functional test provides an opportunity to evaluate the functional capabilities of the cardiovascular system, and the Robinson index characterizes systolic work of the heart. The projective "House-Tree-Person" test provides an opportunity to find out the self-perception and stereotyped reactions of a person. To identify the relationship between the methods, the Pearson correlation coefficient was calculated. Correlations between psychophysiological and psychological research methods of anxiety and depression presence have been determined. It can be argued that the use of psychological projective methods in combination with psychophysiological research provides extensive information about the presence of conscious and unconscious symptom complexes and about the probability of the presence of such personality traits as insecurity, anxiety, aggressiveness, depression, difficulties in self-expression, etc. Early detection of these traits may prevent impairments of military activities in critical periods.

Key words: anxiety states; depression; military personnel; psychophysiological and psychological research methods.

INTRODUCTION

According to the results of scientific research, anxiety, depression, and self-doubt are often manifested at student age, which is caused by various problems: adaptation to a new team, forms of education, volumes of information, life in a dormitory, doubts about the correctness of choosing one's profession. This period coincides with the transition from youth to adulthood, which is a critical and crisis period. The discrepancy between reality and expected events usually causes negative emotions, restlessness, disappointment, and even apathy and depression, especially in cases of repetition of negative situations. Worry and anxiety, as well as depression and apathy, can also be caused by sensory experiences that are usually characteristic of this age. Athletes who study in institutions of higher education have increased psychological pressure. Cadets of military institutions, who must combine a high intellectual level, high physical training and psychological stability, are in even more stressful conditions [1]. Detection of anxiety, depressive tendencies, apathy, and helplessness is very important for providing appropriate professional assistance to these categories of the population [2, 3]. In Ukraine today, given

the military realities, this topic is quite relevant.

Research shows that military personnel are at greater risk of psychological disorders and related symptoms than civilians. Psychological and physical limitations in behavior can increase the presence of these disorders. In addition, the symptoms experienced may limit participation in health-promoting behaviors. Military personnel of different countries, of both genders, of different religions, of different nationalities and races, have increased risks of psychological disorders, although there is variability in their manifestations [4–10]. In Ukraine, such studies have increased in connection with the psychological consequences of the presence of military personnel in the combat zone, starting from 2014. This problem has become particularly acute since February 24, 2022, from the beginning of Russia's full-scale invasion of the territory of Ukraine. A high frequency of anxiety and depressive disorders was found in servicemen participating in military operations [11–13]. It should be emphasized that such studies always require a comprehensive approach, because stressful situations in which military personnel find themselves usually reveal all deep subconscious accumulations formed, including, in childhood [8, 14]. There is evidence that when veterans retire, they may experience depressive and anxiety states, the causes of which arose over several years and decades in connection with the professional direction of activity [15].

The presence of a causal subconscious basis of anxiety and depressive disorders can prevent the performance of complex military tasks, especially during hostilities, when captured, when seriously wounded, etc. Identifying certain subconscious accumulations, bringing them to the level of awareness, and processing them – this is the task of a serviceman under the guidance of relevant competent specialists.

The purpose of our research is to identify signs of anxiety, depression, apathy, and other negative states at the subconscious level in cadets of a military institution using a complex of psychological and psychophysiological research methods.

METHODS

The Hospital Anxiety and Depression Scale (HADS) (Zigmond A.S. & Snaith R.P., 1983) is a fairly simple and obtainable method for the initial detection and assessment of the severity of depression and anxiety symptoms. The methodology contains two parts (subscale A – "anxiety" – determining the level of anxiety, subscale B – "depression" – determining the level of depression). The expression of anxiety syndrome was studied using the well-known Hamilton Anxiety Rating Scale (HARS) (Hamilton M., 1960), which is an important and convenient diagnostic tool for specialists. The technique allows quantitative assessment of the expression of anxiety disorders in a wide range. This technique makes it possible to detect symptoms of anxiety at the level of vegetative reactions of the body.

States of anxiety and depression can affect the state of the nervous system (especially the autonomic nervous system) and the cardiovascular system, and on the other hand, a certain functional state of these systems can cause anxiety or depression. To assess the adaptation potential, the method of determining the index of functional changes (IFC) or the health factor (HF) according to R. M. Bayevsky and O.P. Berseniova was used. It takes into account both functional reserves and the degree of tension of regulatory mechanisms that ensure homeostasis. In the most general form, adaptation potential (AP) has a direct relationship with the level of functioning and an inverse relationship with the degree of tension of regulatory systems. The level of functioning is reflected by: heart rate, blood pressure, height, body weight and age [16].

Index of functional changes (according to R.M. Bayevsky):

$$IFC = 0.011 \cdot HR + 0.0114 \cdot BPs + 0.008 \cdot BPd + 0.009 \cdot BW + 0.014 \cdot A - 0.009 \cdot H - 0.27,$$

where IFC is the index of functional changes

(c.u.); HR - heart rate (bpm); BPs - systolic blood pressure (mm Hg); BPd - diastolic blood pressure (mm Hg); BW - body weight (kg); A - age (years); H - height (cm).

Adaptation processes are ensured by the coordination of the activities of all organs by the autonomic nervous system. The predominance of a certain department of the autonomic nervous system is determined by Vegetative Kerdo's index, according to the formula [17]:

IKerdo = (1 – BPd / Pulse) · 100,

where: IKerdo - autonomic index, BPd - diastolic blood pressure.

Numerical values of the index show the predominance of tones of the departments of the autonomic nervous system, such as:

1) *pronounced parasympatheticotonia* is the predominance of parasympathetic tone;

2) *parasympatheticotonia* is an intermediate state between normal and parasympathetic tone;

3) *norm* is a balance of sympathetic and parasympathetic influences;

4) *sympatheticotonia* is an intermediate state between normal and sympathetic tone;

5) *pronounced sympatheticotonia* is the predominance of a sympathetic tone.

Characteristics of sympatheticotonia are the predominance of dissimilation processes, extroversion, and increased activity, i.e. ergotropia. In the case of parasympatheticotonia, the processes of assimilation decreased activity, and introversion, i.e. trophotropia, is noted. Rufier functional test (according to the Order of the Ministry of Health of Ukraine and the Ministry of Education and Science of Ukraine dated 07.20.2009, No. 518/674) is as follows. After rest, a load is performed – 30 squats with arms stretched forward for 45 sec, after which the subject sits down, and the heart rate is counted for the first 15 sec and the last 15 sec of the first minute of recovery.

The index is calculated according to the formula:

RI = (4 · (HR1 + HR2 + HR3) – 200) : 10,

where RI is the Ruffier index, HR1 is the heart rate in 15 sec at rest, HR2 is the heart rate in the first 15 sec of the first minute of recovery, HR3 – heart rate during the last 15 sec of the first minute of recovery.

Ruffier index makes it possible to assess the functional capabilities of the cardiovascular system, in particular, the determination of the speed of recovery of the pulse after physical exertion. The levels of the functional reserve of the heart are determined taking into account five gradations: less than 3 – a high level; 4–6 – above average (good); 7–9 – average; 10–14 – below average (satisfactory); more than 15 is low.

The Robinson index (according to G.L. Apanasenko, 1992) characterizes the systolic work of the heart and is calculated according to the formula:

IRobinson = HR · BPs / 100, where HR is the heart rate at rest, BPs is systolic (maximum) blood pressure.

Classification of the Robinson index is an indicator of the level of physical health (conditional units): low - 101 and >, lower than average - 91–100, average - 90–81, higher than average - 80–75, high <74.

To determine the degree of connection density between the received digital material of various indicators, the Pearson correlation coefficient was calculated using IBM SPSS 21.0.

A number of projective methods are also used in the practice of military psychologists. Projective methods are designed to diagnose the personality as a whole, and not just to identify individual personality traits. A projective technique is quite often used – the drawing test «House-Tree-Person» (methodology proposed by J. Buck in 1948). J. Buck claimed that every picture that a person draws is a reflection of the his personality. Drawings can show the affective sphere of the personality, its needs, and the level of psychosexual development. The method is valid, has been used successfully for a long time, and has been confirmed in parallel research using other methods and techniques [18–20].

In the research, servicemen were asked to depict a tree, a house and a person in one picture,

according to the modification of the test by the researcher R. Burney. 48 male servicemen aged 19–22 took part in our study. All servicemen have daily general physical activity (jogging, cross-country, swimming), and also individually engage in a certain type of sport (boxing, powerlifting, football, wrestling, etc.).

The results of psychophysiological and psychological studies were analyzed. To determine the degree of connection density between the received digital material of various indicators, the Pearson correlation coefficient was calculated using IBM SPSS 21.0.

RESULTS AND DISCUSSION

A study of the presence of anxiety disorders and symptoms of depression and anxiety showed the following. Only 27% of the subjects had the norm for all three indicators at the same time. Using the calculation of the index of functional changes (IFC), the level of functional capabilities is assessed, as well as the adaptation potential of the cardiovascular system is determined. When calculating the IFC in our study, it was found that 39.58% of the studied servicemen had a satisfactory state of adaptation, adaptation tension – 47.92%, unsatisfactory adaptation – 10.42%, and one serviceman showed adaptation failure according to the health factor – 2.08% (Fig. 1).

The fact that almost half of the studied servicemen had adaptation tension can be explained by constant professional stress.

It is known that the ratio of heart rate and blood pressure normally remains constant.

Based on this regularity, Kerdo index is used to determine the state of the autonomic nervous system. It turned out that, according to the Kerdo index, for a large percentage (39.58%) among the studied persons, a balanced influence of the sympathetic and parasympathetic nervous system is characteristic. But for the majority, parasympathetic influences prevail - 41.67% (pronounced parasympatheticotonia - 22.92%, parasympatheticotonia - 18.75%). The predominance of the sympathetic nervous system has the smallest number of studied people - 18.75% (sympatheticotonia 16.67%, pronouncedsympatheticotonia - 2.08%) (Fig. 2).

The results of research using the HARS and HADS methods represent in Table 1.

A weak inverse relationship (–0.32, Pearson's correlation) was determined between the adaptation potential of the cardiovascular system (IFC) and the state of the autonomic nervous system (according to Kerdo index). At the same time, the use of rank evaluation reveals those differences that are not revealed by other statistical methods. In this comparison, the rank evaluation reveals an acquired relationship of medium strength (–0.52). Therefore, the higher the level of anxiety, the weaker the adaptation. The levels of the functional reserve of the heart (Ruffier index) show a high relationship with the health factor (0.82) and a medium strength relationship (0.60) with the Robinson index, which characterizes the systolic work of the heart. The level of adaptation potential has a direct correlation of average strength with the expression of anxiety disorders according to the Hamilton Anxiety Rating Scale (0.76), Hospital
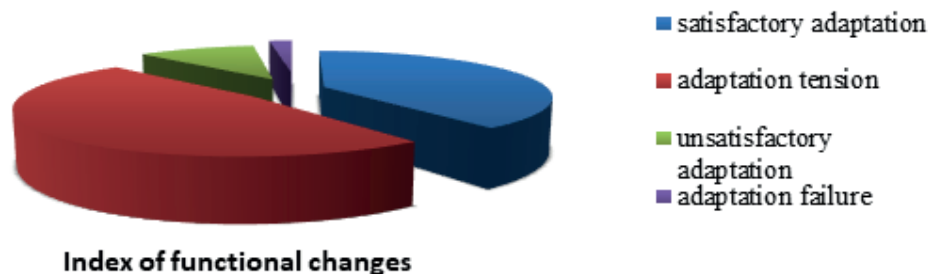

- satisfactory adaptation
- adaptation tension
- unsatisfactory adaptation
- adaptation failure

Index of functional changes

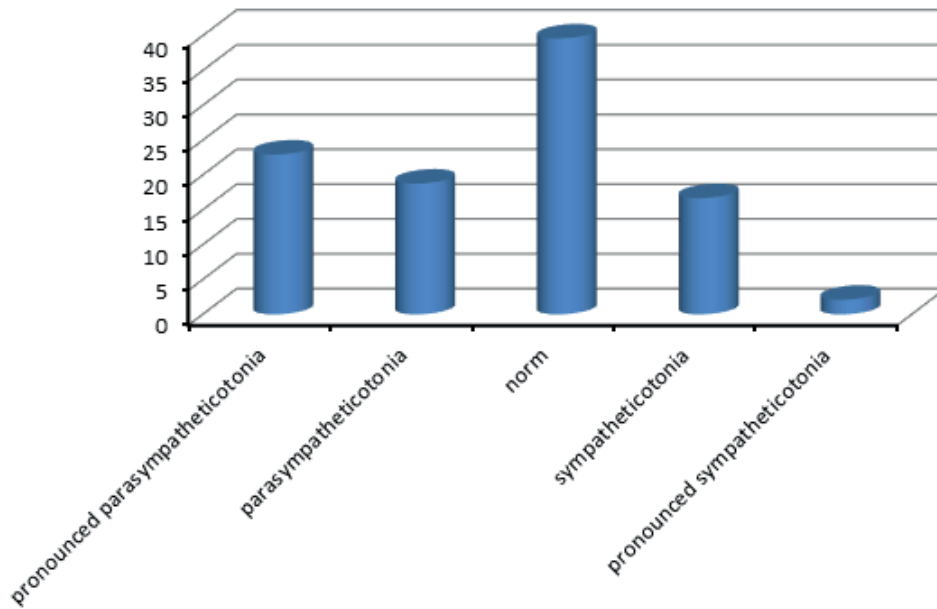Fig. 1. Levels of adaptation (according to IFC) in the studied servicemen (%), n = 48

Fig. 2. State of the autonomic nervous system (according to Kerdo index), n = 48

Anxiety Scale (0.65) and Depression – weak strength (0.44). It should be noted that there is a direct correlation between the level of adaptation potential and drawing tests (drawing test «House-Tree-Person»). The weaker the level of adaptation potential, the more pronounced signs of anxiety in the pictures (0.51, according to Pearson) and depression (0.48, according to Pearson).

The cardiovascular system works under the unconscious guidance of the autonomic nervous system. Therefore, it was important to study the relationship between the levels of anxiety, depression and the tone of the autonomic nervous system. According to Kerdo Autonomic index, individuals with probable anxiety disorders mostly have moderate and pronounced sympatheticotonia. Persons with subclinically pronounced depression have parasympatheticotonia, and those with clinically pronounced depression have pronounced

Table 1. Expression of anxiety syndrome (according to the Hamilton Anxiety Rating Scale, HARS), anxiety and depression (according to the Hospital Anxiety and Depression Scale, HADS) in military personnel (n = 48)

HARS		HADS			
Anxiety scale	Relative quantity, %	Anxiety scale	Relative quantity, %	Depression scale	Relative quantity, %
no symptoms of anxiety	37.5	anxiety`s not detected	75	depression not detected	58.33
may have anxiety disorders	43.75	subclinical anxiety	18.75	subclinical depression	39.59
Anxiety	12.5	clinically pro-nounced anxiety	6.25	clinically pronounced depression	2.08
symptomatic anxiety	6.25				
pronounced anxiety state	0				

parasympatheticotonia. Individuals who have shown the absence of anxiety or depression are characterized by a balance of sympathetic and parasympathetic influences or are on the edge of this balance. A comparative rank assessment of the predominance of the tone of a certain department of the autonomic nervous system reveals correlations with the data of the HARS and HADS scales. This especially applies to the comparison with depressive manifestations according to the HADS scale, the inverse relationship of medium strength (−0.77). And the drawing test reveals an even deeper hidden depression, a strong inverse correlation (−0.84). To understand the hidden causes of the described conditions, to diagnose the internal emotional state, as well as problems of the subconscious (works with archetypes), one of the most common projective tests can be used, the drawing test – "House-Tree-Person". This is quite important, due to the fact that the military often finds themselves in unnatural situations for the average person, which can provoke a sharp explosion of subconscious accumulations. Therefore, in order to obtain a deeper picture of the internal state of a person, hidden elements of the probability of anxiety presence, depression, apathy, weakness, or aggression, we used just such a test. Thus, the detected signs of anxiety using the named projective test show a positive correlation with the expression of anxiety states according to the HARS method (0.69), as well as the detected signs of depression also have a positive correlation with the data of the HARS method (0.67) (rank evaluation).

Comparison of the data from the projective test (anxiety) with HADS anxiety values shows a positive correlation of medium strength (0.53). Regarding the correlation between the detected signs of depression in the drawing test and the manifestation of depression according to the HADS method, it is quite high (0.8). This testifies to the significant validity of the projective methodology in the context of detecting anxiety and depression in individuals. It turned out to be interesting the

fact that there is a 100% correlation between the levels of anxiety and depression determined in the drawings of the studied servicemen (1.0 according to the Pearson coefficient). What exactly when depicting a house, a tree, and a person showed signs of anxiety in the subjects? These are also manifestations of experiencing a sense of deprivation (a house is depicted in the background, or a person stands with his back to the house) – 58.3%. In addition, 34% of the houses do not have a pipe, which confirms that the subject feels a lack of soulfulness and home warmth. In 16.6%, this is also confirmed by a thin stream of smoke – a feeling of lack of emotional warmth in the home. 12.5% is a significant regression (the pipe is drawn obliquely in relation to the roof). In 20.8% of cases, a back or side door is depicted, which can indicate alienation and avoidance. Images of windows showed: 6 subjects have fear, aggression, a sense of danger and lack of freedom (bars on the windows), which, most likely, is related to the specifics of the profession, and six more subjects have a picture of a house with too thick walls is combined with a powerful roof, which can reveal internal tension and the nee for protection [18–20]. The image of the figure at the bottom of the sheet demonstrates the presence of feeling insecure and prone to depression in military personnel (20.8%) [18, 19].

Roots are the role and significance of one's past, and family lineage. When a person cuts off its roots when depicting a tree he does not want to see and remember his parents and his childhood 25% (most often this is connected with psychological trauma in childhood). To a certain extent, this is confirmed by the fact that some individuals may have had complex traumatic situations and sexual experiences (hollow, especially strongly indicated, 12.5%). Two of the subjects depicted an animal in a hollow tree as a reflection of the need for protection and peace.

According to the interpretations of the drawing test, the tree trunk is an analog of the human body. A third of the subjects have

difficulties in establishing contacts (the depicted tree has a trunk without branches), which can definitely cause internal imbalance and discomfort; 45.8% are looking for support (the trunk is tilted to the right). Half of the subjects have difficulty imagining their future and life prospects (no crown (leaves)), which is a basis for concern [18, 19].

The shading of the tree is of great importance when interpreting the picture: medium shading is a sign of concern, and strong shading is a sign of anxiety. Darkening of the leaves, trunk, and roots is a sign of state anxiety (12.5%). Signs of children's trauma were also revealed (grass at the base of the tree).

The image of a person expands the idea of personality properties. Six military personnel depicted a rather large figure, which can mean anxiety and stress «here and now», weak internal control and expansiveness. Instead, more than 40% of the drawings depicted figures that are quite small in size, which may indicate the presence of depression, low self-esteem, chronic anxiety and poor adaptation. A bent figure can reflect a lack of mental balance and instability.

Four of the subjects depicted a figure with bulging eyes, pursed lips, or an open mouth with bared teeth, which experts interpret as a symbol of aggression. The image of large eyes is a symbol of fear or anxiety (25%). One-eighth of the subjects emphasized the nostrils quite strongly in the face drawings, which reflects primitive aggression. A third of the subjects marked the mouths with one straight line, which may indicate internal tension. More than half of the studied servicemen strive to avoid negative sound effects, to drown out criticism (the depicted person had no ears). The torso is a symbol of the idea of a person's physical appearance. A quarter of the people who took part in the task showed the presence of a feeling of humiliation and inferiority (the body is abnormally small).

An image of a person with pronounced disproportions of the right and left sides of the body may indicate a lack of personal balance (20.8%), and an unbalanced body posture may

indicate internal tension (12.5%). Seven persons can be characterized by serious alienation, isolation and oppositional tendency, the person is depicted in an absolute profile. When analyzing the drawings, we paid attention to the fact that in 20% of cases, the figure is depicted in a completely childlike way, made of sticks, which are deciphered by specialists as a desire for detachment and negativism.

Analysis of the image of the shoulders shows a different manifestation of physical strength or the need for power. Clumsy shoulders indicate caution and protection (4.17%). Slouched shoulders indicate despair and guilt (29.2%). It turned out to be strange that nine servicemen in the image of a person had missing shoulders.

Hands are a symbol of activity, communication and sociability. Indistinctly outlined hands indicate self-doubt, in activities and social relationships [18, 19]. 7 servicemen in the picture of a person draw no hands, which can be interpreted as a sign of passivity, inactivity, incommunicability, timidity, and intellectual immaturity. The image of the hand as a boxing glove is a sign of suppressed aggression (4.17%). In combination with such features of the drawing as the absence of a mouth and torso, it indicates a poor adaptation of a person. In addition, it can express the guilt that a person feels about his aggressiveness. Strongly shaded hands can mean the same thing [18].

Legs in drawings of a person are a symbol of support, stability, and focus on practical orientation. When studying the drawings, we found that in 8.3% of cases, the depicted figure has no legs (or a painted pedestal), which may indicate isolation and a feeling of lack of support. Feet with toes pointed at the observer, or the absence of feet symbolizes a feeling of self-doubt(39.6%). There were also drawings with weak, short, and poorly drawn legs, which is a sign of self-doubt, weakness, and a decline in spirit. Drawings with small, unstable feet show feelings of insecurity (20.8%) [18, 19].

There are studies by scientists who consider human images as medical diagnostic material.

Indeed, there is evidence that the presence of a break in the line between the head and the body can indicate a tendency to hypertension. There were two such drawings among the studied servicemen. Moreover, what is interesting, both servicemen are overweight.

Strong hatching of hands and feet may indicate the presence or tendency of eczema. This is how six servicemen drew their limbs. Eczema was not detected in them (according to medical records). But 5 of them have certain skin problems. Two subjects shaded the neck and chest area on the drawing of a person. According to scientific research, this may indicate the presence or predisposition to bronchial asthma. In our case, there are no such confirmations. But it turned out that they suffer from bronchitis and tracheitis more often than other subjects. The figure was entirely shaded by 6 servicemen. Scientists see correlations with gastritis [20]. This was confirmed in our research.

A gap between the head and body, and the hatching of the entire figure may indicate osteochondrosis. As for this statement, there is no confirmation in our research, but this is most likely due to the fact that military personnel did not undergo a thorough examination of bone density.

The projective technique «House-Tree-Person» significantly enriches the understanding of the deep reasons for the motivation, drives, complexes, etc. of the individual. So, it can be argued that the use of psychological research (especially projective methods) in combination with psychophysiological research provides extensive information about the presence of conscious and unconscious symptom complexes about the probability of the presence of such personality traits as insecurity, anxiety, hostility (aggressiveness), difficulties in self-expression and conflict (in particular, internal), repressiveness and apathy.

CONCLUSIONS

It is quite important to identify the probability of the presence and level of anxiety and depression and their causality in relation to the professional specifics of military personnel. The cause-and-effect relationship is purely physiological, a disproportion in the functioning of two departments of the autonomic nervous system that are opposite in direction is possible. The determination of adaptation potential takes into account not only functional reserves but also the degree of tension of regulatory mechanisms that ensure homeostasis. Experiencing anxiety and depression can be related to heart functioning, on the one hand, and on the other hand, it can be the cause of deterioration of its functioning.

Correlations between the indicators of psychophysiological studies and studies using the psychological projective test «House-Tree-Person», make it possible to find out the stereotyped reactions of an individual, self-perception, and behavior in a team, which were formed in one`s ontogenesis. These personality qualities can be hidden until a certain time. Force majeure circumstances in an individual's life are a litmus test for the manifestation of internal, subconscious accumulations of his psyche. Military personnel is not in any way special in terms of the presence of signs of anxiety, depression, aggression, etc. in the structure of their personalities. However, the identification of these psychological and psychophysiological properties of the individual is quite important in view of the professional direction of the activity. Similar research should be versatile and comprehensive. The next step is psychological work with the serviceman, bringing the diagnosed problem to the level of awareness and conscious work on it.

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КОМПЛЕКСНИЙ ПСИХОФІЗІОЛОГІЧНИЙ ПІДХІД ДО ДІАГНОСТИКИ ТРИВОЖНИХ ТА ДЕПРЕСИВНИХ СТАНІВ У ВІЙСЬКОВОСЛУЖБОВЦІВ

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Метою нашого дослідження було вивчити наявність тривоги та депресії у 48 військовослужбовців чоловічої статі віком від 19 до 22 років. Використовували психофізіологічні та психологічні методики: «Госпітальну шкалу тривоги та депресії» та шкалу тривоги Гамільтона. Для оцінки адаптаційного потенціалу застосовували метод визначення індексу функціональних змін, який враховує як функціональні резерви, так і ступінь напруження регуляторних механізмів, що забезпечують гомеостаз. Процеси адаптації забезпечуються координацією діяльності всіх органів з боку автономної нервової системи. Переважання певного її відділу визначали за вегетативним індексом Кердо. Проба Руф'є давала можливість оцінити функціональні можливості серцево-судинної системи, а індекс Робінсона -- систолічну роботу серця. За допомогою проєктивного тесту «Будинок. Дерево. Людина» з'ясували самосприйняття, стереотипні реакції особи, які сформувались в її онтогенезі. Для виявлення зв'язку між методиками розраховували коефіцієнт кореляції Пірсона. Визначено кореляції між психофізіологічними та психологічними методами дослідження наявності тривоги та депресії. Можна стверджувати, що використання психологічної проєктивної методики в сукупності із психофізіологічними дослідженнями дають об'ємну інформацію щодо наявності усвідомлених та неусвідомлених симптомокомплексів щодо ймовірної наявності таких властивостей особистості, як незахищеність, тривожність, агресивність, депресивність, труднощі в самовираженні та ін. Прояв негативних підсвідомих властивостей у критичні періоди можуть зашкодити виконанню військової діяльності.
Ключові слова: тривожні стани; депресія; військовослужбовці; психофізіологічні та психологічні методи дослідження.

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