ORIGINAL ARTICLE

CONTENTS

Psychological training of future specialists in the security and defense sector in extreme conditions: Evaluation of cognitive and emotional reactions to stress and human potential development

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ABSTRACT

Aim: The aim of the study is to determine the effectiveness of psychological preparation methods for future specialists in the security and defense sector in extreme conditions, specifically evaluating emotional and cognitive reactions to stress factors, and exploring the potential of human resources in these conditions to enhance the effectiveness of professional activities

Materials and Methods: The study involved cadets from Dnipro State University of Internal Affairs, divided into two groups: Group 1 (control, n=120, mean age 18.86±1.25) received standard training, while Group 2 (experimental, n=120, mean age 18.73±1.19) underwent 10 months of specialized training for extreme conditions

Results: A special training program with crisis models, such as "Technogenic disaster in a combat zone," led to a statistically significant difference between the control and experimental groups ($p<0.05$) after using the Stress Resistance Scale.

The Cattell test (16 RF) showed that the experimental group had a higher emotional stability score compared to the control group.

Emotional stability test results revealed lower anxiety levels in the experimental group ($p<0.01$).

A framework for "Human Potential Development through Assessment and Adaptation" was developed, focusing on emotional and cognitive reactions. Practical recommendations were provided to improve training programs and enhance psychological resilience for future specialists in the security and defense sector.

Conclusions: Improving special training programs for future specialists in the security and defense sector should integrate physical, cognitive, and psychological aspects, considering individual traits. A systemic approach, including psychological preparation and stress management skills, will enhance psychological resilience, essential for success in extreme conditions.

KEY WORDS: security and defense sector, cadets, crisis situations, emotional stability, extreme conditions, cognitive reactions

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INTRODUCTION

In today's world, against the backdrop of evolving global, national, and local security threats, a high level of preparedness among specialists in the security and defense sector is one of the key conditions for effectively countering these challenges [1]. Psychological training for future specialists in the security and defense sector is a leading aspect that includes the development and improvement of stress resistance, emotional stability, and the enhancement of cognitive functions in extreme conditions [2, 3]. In this context, the evaluation of emotional and cognitive reactions to stress as an indicator of human potential development is an important component of the preparation process for future specialists in the security and defense sector [4, 5].

Considering the significant impact of stress on decision-making ability and the effective performance of service tasks in critical situations, studying cognitive and emotional reactions to stress becomes vital for developing effective, modern methods of preparing future specialists for the security and defense sector [6, 7].

Testing and training based on psychological methods not only allows for assessing the current level of readiness but also enhances the effectiveness of training programs aimed at increasing resilience to stress for future specialists.

AIM

The aim of the research is to determine effective methods for the psychological preparation of future specialists in the security and defense sector in extreme conditions, specifically evaluating emotional and cognitive reactions to stress factors, as well as exploring the potential of human resources in these conditions to enhance the effectiveness of professional activities.

The scientific novelty of the chosen topic lies in: 1) the integration of modern psychological training methods to assess and develop emotional and cognitive reactions of future specialists in the security and defense sector in extreme conditions; 2) the first-time exploration of the relationship between psychological indicators and the overall development of human potential in this context, which allows for improving preparation for stress situations; 3) the assessment of cognitive functions (attention, memory, reaction to stress) using modern testing methods and emotional self-control techniques, which allows for identifying priority contemporary approaches to preparing future specialists for effective work in conditions of uncertainty and high risk.

OBJECTIVES

1. Analysis of the main psychological aspects of preparing future specialists in the security and defense sector to work in extreme conditions.
2. Evaluation of emotional and cognitive reactions of future specialists to stress situations using specialized tests.
3. Study of the impact of key human potential indicators in the context of psychological preparation for future specialists.
4. Development of practical recommendations for improving psychological preparation to enhance the quality and effectiveness of professional activities for future specialists in the defense and security sector in extreme conditions.

MATERIAL AND METHODS

The study was conducted with the participation of cadets from Dnipro State University of Internal Affairs (future specialists in the security and defense sector). The subjects were divided into two groups: Group 1 (control, n=120) consisted of males and females aged 17-20 years (mean age 18.86±1.25 years), who were undergoing standard training without specialized training for working in extreme conditions. Group 2 (experimental, n=120), with a mean age of 18.73±1.19 years, underwent training for 10 months using a specialized training program that included crisis and combat situation simulation models, and also incorporated training for the development of self-control, stress resistance, and emotional stability. Groups 1 and 2 were formed considering sample homogeneity (age, health status, physical fitness, and psychological stability).

METHODS

Analysis of specialized scientific and methodological literature; surveys; psychological testing (Stress Resistance Scale, Cattell's Multivariate Personality Inventory (16 RF), Emotional Stability Test). The obtained results were processed using mathematical statistics methods with the Statistics 10.0 program. Calculations included the following measurements: arithmetic mean, standard deviation. For comparing independent samples, the non-parametric Mann-Whitney U test was used, as the data did not meet the normality assumption. A difference was considered statistically significant at $p<0.05$.

ETHICS

This work complies with the principles of the Declaration of Helsinki.

RESULTS

The qualitative preparation of future specialists in the security and defense sector requires a special, specialized approach, as the work of this contingent is associated with extreme conditions that demand not only physical preparedness and special endurance but also a high level of psychological resilience [8, 9]. Therefore, the psychological aspect is an important component in the overall comprehensive training of such specialists. In this context, several key factors are identified that determine the effectiveness of psychological training (Fig. 1).

The training program for future specialists has been enhanced with a series of innovative, specialized crisis models in various areas. Below is an example of one such crisis simulation model, which was implemented for the experimental group under the training title "Technogenic Disaster in a Combat Zone" (Fig. 2).

Situation Type: Technogenic disaster (accident at an energy facility) during active combat operations in a territory where simultaneous rescue operations, evacuation of civilians, and ensuring the safety of infrastructure facilities must be carried out.

Duration of the scenario – four hours. The main objective of this training crisis situation is to improve the ability to overcome stress and respond effectively in extreme situations for future specialists in the security and defense sector. Overall, the experimental group

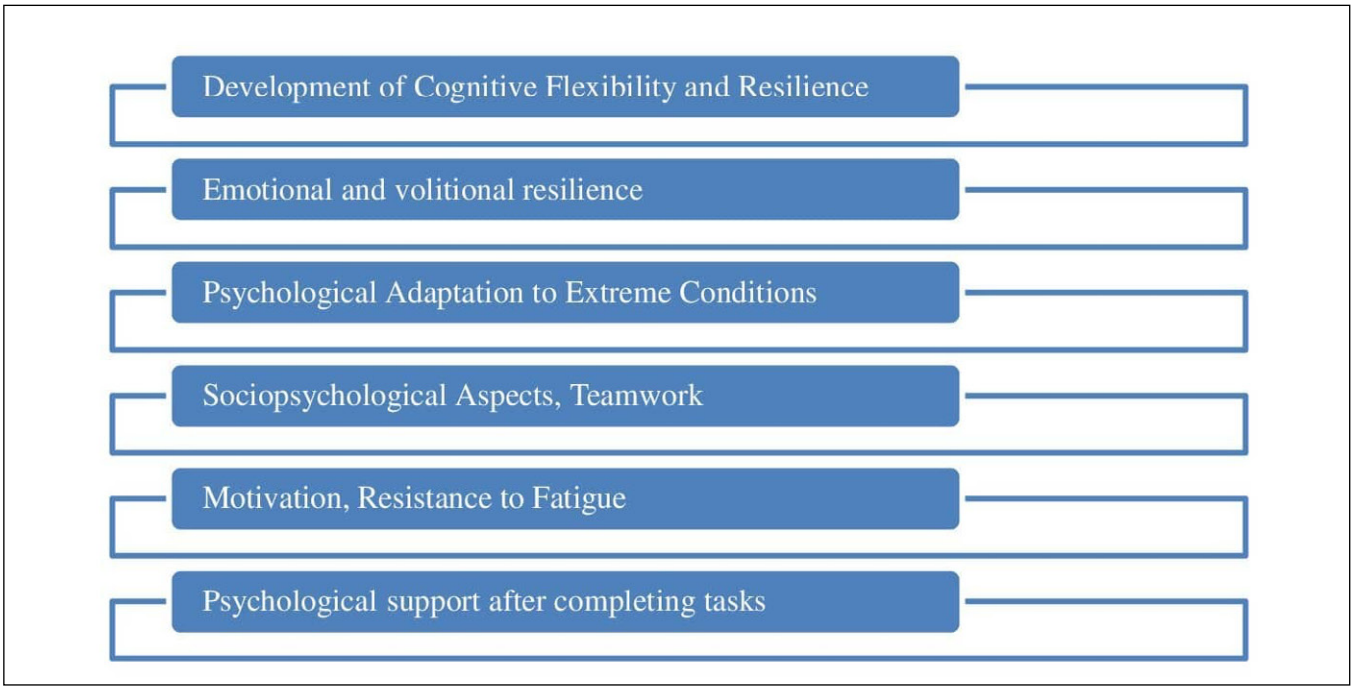

Fig. 1. Psychological aspects of training future specialists in the security and defense sector under extreme conditions
Picture taken by the authors

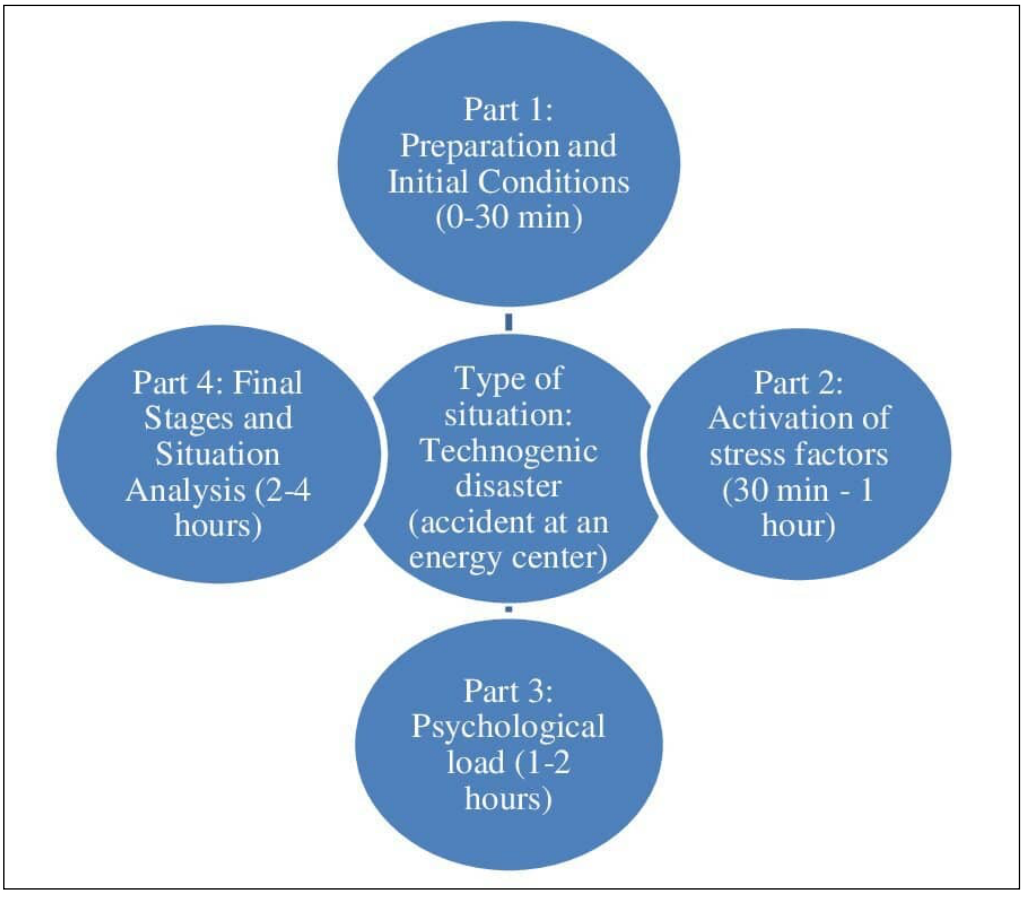

Fig. 2. Crisis model "Technogenic Disaster in a Combat Zone"
Picture taken by the authors

was trained in specialized conditions throughout the academic year (10 months).

As is well known, individuals with high stress resistance have a better ability to adapt to extreme situations. An important aspect is the ability of a person to endure high levels of stress while maintaining performance and emotional stability. Specialists with a high level of emotional stability are less prone to intense emotional reactions to stress, which allows them to maintain control over their behavior and emotions.

Table 1. Comparative characteristics of the Stress Resistance Scale test indicators for future specialists in the security and defense sector before and after the experiment

Indicators	Before implementation (X±S)		After implementation (X±S)	
	Control group (1) (n=120)	Experimental group (2) (n=120)	Control group (1) (n=120)	Experimental group (2) (n=120)
1.Stress resistance (rated on a scale of 1-10)	5.64±0.52	5.86±0.55	6.11±0.60	7.94±0.77
2. Decision-making time (seconds)	25.44±2.21	24.55±2.18	24.88±2.15	17.03±1.88
3.Team interaction effectiveness (rated on a scale of 1-10)	6.12±0.66	6.45±0.62	6.79±0.65	8.24±0.89
4.Number of mistakes during task execution (number of mistakes per 30 minutes)	3.65±0.38	3.89±0.37	3.43±0.32	1.32±0.13
5.Psychological burnout (rated on a scale of 1-10)	6.89±0.67	7.02±0.79	6.42±0.63	4.46±0.46
6.Evaluation of decisions by effectiveness level (rated on a scale of 1-10)	7.32±0.78	7.10±0.70	7.56±0.76	8.96±0.87
7.Physical endurance level (rated on a scale of 1-10)	6.62±0.69	6.96±-.66	6.54±0.65	7.58±0.76
8. Trust level within the team (rated on a scale of 1-10)	6.11±0.62	6.56±0.63	6.84±0.68	8.25±0.89
9. Psychoemotional state after training (rated on a scale of 1-10)	5.73±0.56	6.04±0.61	5.98±0.56	7.89±0.77
10. Overall task execution effectiveness (rated on a scale of 1-10)	6.32±0.64	6.74±0.67	6.87±0.65	8.74±0.88

Note: * - Statistically significant difference after the experiment compared to the control group (Group 1) according to the Mann-Whitney U test at $p < 0.05$
Source: compiled by the authors of this study

Table 2. Comparative characteristics of future specialists in the security and defense sector according to the Cattell's 16 Personality Factor Questionnaire (16 PF) – results after the experiment

Parameter (Factor)	Control group (n=120)		Experimental group (n=120)	
	X±S	Level	X±S	Level
1.Factor A (Judgment)	5.54±0.56	Average	6.98 ±0.68*	Higher
2.Factor B (Emotional Stability)	4.22±0.42	Lower	6.18 ±0.63*	Higher
3.Factor C (Principled Behavior)	6.14±0.69	Higher	7.15±0.74*	Very high
4.Factor E (Social Activity)	4.86±-.50	Average	5.91±0.56	Higher
5.Factor F (Self-Control)	5.07±0.53	Average	6.64±0.58*	Higher
6.Factor G (Intelligence)	5.98±0.58	Average	6.89±0.69*	Higher
7.Factor P (Insecurity)	7.52±0.78	Higher	5.74±0.55*	Average
8.Factor I (Emotional Sensitivity)	7.20±0.74	Higher	5.59±0.43*	Average
9.Factor L (Stress Sensitivity)	6.75±0.66	Higher	5.34±0.52	Average
10.Factor M (Optimism)	6.10±0.62	Average	6.95±0.67	Higher
11.Factor N (Dependence on Surroundings)	5.24±0.55	Average	4.38±0.43*	Lower
12.Factor O (Self-Esteem)	6.65±0.67	Higher	7.32±0.78	Very high
13.Factor Q1 (Need for Change)	5.05±0.54	Average	6.42±0.64*	Higher
14.Factor Q2 (Organizational Skills)	5.48±0.58	Average	6.12±0.65	Higher
15.Factor Q3 (Independence)	6.42±0.65	Higher	5.46±0.58*	Average
16.Factor Q4 (Tension)	6.88±0.66	Higher	5.14±0.52*	Average

Note: Statistically significant difference after the experiment between the control and experimental groups' indicators according to the Mann-Whitney U test * - <0.05
Source: compiled by the authors of this study

The main method for assessing emotional resilience and cognitive functions is psychological testing, which includes standardized techniques that allow for a qualitative assessment of an individual's overall mental readiness, emotional state, stress resistance, and cognitive abilities. Within the framework of our study, several methods were used for future specialists in the security and defense sector.

Cadets, as future specialists in the security and defense sector, were offered a stress resistance test (Stress

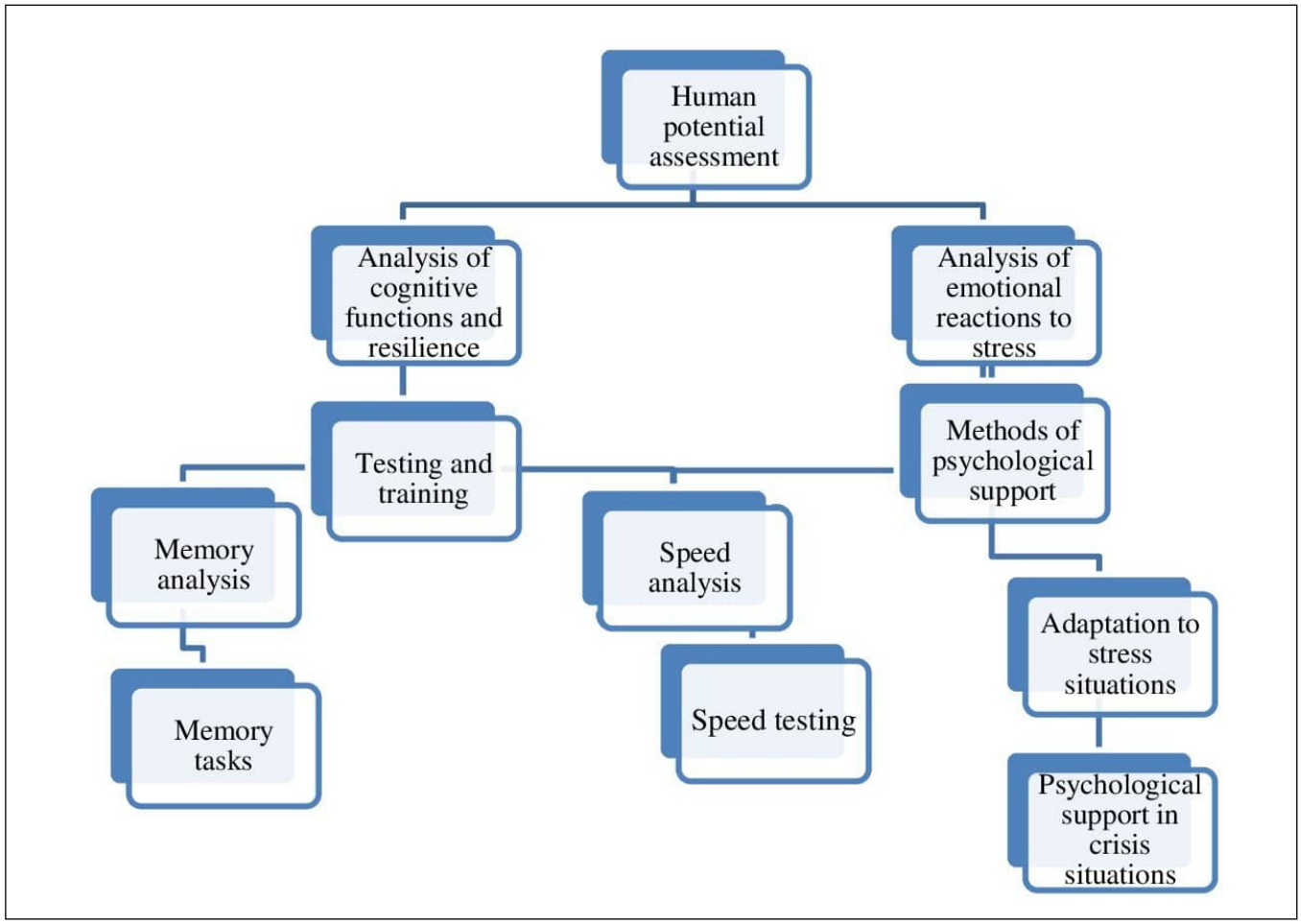

Fig. 3. Assessment of an individual`s human potential based on the quality of cognitive functions and emotional-volitional resilience
Picture taken by the authors

Resistance Scale) (Table 1) with key categories such as response time, teamwork, psychological burnout, physical endurance, and others.

The diagnosis of personal characteristics of future specialists in the security and defense sector, such as stress resistance and psychological readiness, was carried out using the Cattell's 16 Personality Factor Questionnaire (16 RF), which allows for identifying various components of personality and its reactions to stress (Table 2).

To assess the level of emotional stability in the control and experimental groups of future specialists in the security and defense sector, the Emotional Stability Test was used. The results of this test allow for determining the ability to control one's emotions and maintain calm in extreme conditions (Table 3).

The assessment of the physical and psychological aspects of training for future specialists and their impact on professional activity becomes a key factor in enhancing work efficiency in high-risk conditions.

Fig. 3 presents a model that includes the process of evaluating and developing human potential through the analysis of emotional and cognitive reactions. Memory and reaction speed training works in conjunction with psychological support and adaptation methods.

We have developed a series of practical recommendations to improve specialized training programs and enhance the psychological resilience of future specialists in the security and defense sector under extreme conditions (Table 4, Table 5).

DISCUSSION

Psychological training is a leading component in shaping the professional readiness of future specialists in the security and defense sector under extreme conditions [8, 9]. One of the general factors in the preparation of future specialists is cognitive flexibility and resilience, which is defined by the ability to quickly adapt to changing conditions and consider various decision-making options, among other things [10, 11].

Specialists in the security and defense sector must be able to rapidly adjust their behavior depending on the emerging circumstances: extreme situations can change by the minute, so they must possess the skills to regroup forces, maintain stable management, adjust

Table 3. Results of the Emotional Stability Test among future specialists in the security and defense sector after the experiment

Assessment parameter	Control group (n=120)		Experimental group (n=120)		Mann-Whitney U test
	X±S	Level of emotional stability	X±S	Level of emotional stability	
1.Anxiety level	7.42±0.90	High	5.16±0.52	Low	<0.01
2.Self-control ability	5.18±0.52	Low	7.54±0.78	High	<0.01
3.Speed of recovery after stress	6.93±0.72	Slow	4.56±0.54	Fast	<0.01
4. Stress sensitivity level	6.80±0.79	High	4.23±0.48	Low	<0.01
5.Emotional stability under stress load	5.52±0.67	Average	7.34±0.70	Higher	<0.01
6.Ability to remain calm in crisis situations	5.92±0.69	Average	6.98±0.69	Higher	<0.05
7.Reaction to external pressure	7.14±0.80	Nervous	5.56±0.62	Reserved	<0.01
8.Emotional reactivity	6.44±0.65	High	4.52±0.48	Low	<0.01
9.Ability to adapt to changes	6.43±0.59	Insufficient	4.92±0.50	Good	<0.01
10.Overall level of emotional stability	6.08±0.62	Average	6.94±0.72	Higher	<0.05

Source: compiled by the authors of this study

Table 4. Practical recommendations for improving training programs and enhancing psychological resilience for future specialists in the security and defense sector under extreme conditions

Components	Content of the program components. Examples
1. Integration of psychological training into overall preparation	
1) Combination of physical and psychological stress	Physical and psychological exercises that stimulate the ability to adapt and stress resistance in extreme situations (for example, combining physical exertion with elements of psycho-emotional stress to simultaneously improve emotional self-control and physical endurance)
2) Simulation of crisis situations and real combat operations	Development and implementation of highly realistic scenarios of terrorist attacks, combat operations, natural disasters, etc., which help future specialists prepare physically and psychologically adapt to stress factors.
2. Individualization of training based on personality type	
1) Consideration of individual characteristics	Consideration of the personality types of future specialists, psychological readiness, and levels of stress resistance (for example, for individuals with high anxiety levels, introducing more emotion management training; for highly impulsive individuals – exercises on strategic thinking and self-control).
2) Consultations, psychological selection	It is advisable to conduct this during the candidate selection stage. Regular psychological support and counseling during training and service to maintain mental stability and sustain a high level of stress resistance.
3. Training in stress management strategies	
1) Development of emotional intelligence	Training future specialists in effective emotional management strategies (meditation, breathing practices, relaxation techniques), which significantly reduces stress levels and prevents emotional instability.
2) Exercises for anxiety reduction, self-regulation	Development and implementation of training programs with a set of exercises aimed at reducing anxiety and emotional overload (self-regulation techniques to maintain clarity of thought and relative calm even in extreme circumstances).
4. Development of cognitive functions under stress conditions	
1) Intensive training on reaction speed and multi	The development of future specialists' ability to perform multiple tasks simultaneously under increased stress (simulation of real scenarios, multitasking training), which require simultaneous management and focus on several tasks, making critical decisions under limited resources and time constraints.
2) Improvement of cognitive flexibility and decision	Training using exercises focused on decision-making speed and cognitive flexibility under increased stress, to help future specialists develop the skills needed to make appropriate decisions in high uncertainty and limited information conditions.

Source: compiled by the authors of this study

Table 5. Practical recommendations for improving training programs and enhancing the psychological resilience of future specialists in the areas of team training and recreational activities

Components	Content of the program components. Examples
1. Team training, group interaction	
1) Training team interaction in stressful conditions	For the necessary and important effective teamwork in extreme conditions, it is essential to develop and implement scenarios with team interaction during physical and psychological stress. These scenarios help improve communication, mutual understanding, and reduce the level of conflict situations among team members.
2) Development and improvement of leadership qualities in stressful conditions	The development and implementation of programs that focus on the development of these qualities under stress, skills in maintaining calm and making important decisions in extreme situations, and the ability to lead a team in crisis situations.
2. The Role of Recovery and Rest	
1) Planning breaks and recovery	Incorporating sufficient rest, psychological rehabilitation exercises after stress loads and situations, into training programs for quick recovery of physical and emotional state.
2) Methods of psychological recovery	Providing qualified psycho-emotional support and the opportunity for consultations with specialists (psychologists) for effectively overcoming mental stress after undergoing high-stress training.
3. Systematic monitoring and adjustment of training programs	
1) Evaluation of the effectiveness of training programs	Systematic evaluation of the implementation and effectiveness of programs (collecting feedback from participants using data on their physical, psychophysiological, and psychoemotional state) for adjustments according to the needs and real conditions of professional work.
2) of training programs Regular improvement and feedback	Based on the collection of data on the effective completion of tasks and various stress reactions in extreme conditions, programs will be adjusted by incorporating new training methods to enhance the psychological resilience of the personnel.

Source: compiled by the authors of this study

action plans, and apply various tactical approaches [12].

Quality psychological training for the development and improvement of cognitive flexibility includes specialized exercises that help participants rapidly adjust their thinking priorities (simulations of crisis situations on various topics, where the goal is to make prompt, varied decisions).

A key component of psychological training for future security and defense sector specialists to effectively perform professional duties is emotional stability, which includes the ability to stay calm and focused, control emotions even in dangerous and stressful situations [13, 14].

Future specialists must be able to adapt to circumstances that can suddenly change, manage emotional loads without anxiety or panic. To develop and enhance emotional resilience, future specialists need training in improving self-control, stress management skills, maintaining psychological balance, and more. These skills will ensure high performance when performing professional duties in the future.

The importance of teamwork under stress is crucial in the psychological preparation of future specialists in the security and defense sector. Teamwork in high-stress conditions can be a leading and decisive factor in achieving goals and successfully completing tasks [15, 16]. In this context, psychological training includes the development and improvement of communication skills, role distribution within the group (team), the ability to respond quickly and assess the situation, with an emphasis on resolving conflicts in stressful conditions. An essential aspect of this is fostering mutual support and trust among team members.

In ensuring the high and long-term effectiveness of future security and defense sector personnel in extreme conditions, motivation plays a priority role [17]. The development and enhancement of self-support, internal motivation, and the desire to achieve positive results in challenging conditions should be considered in psychological training. Important skills that need to be taught to future specialists include proper management of fatigue and energy resources, as exhaustion while performing professional tasks can significantly reduce work efficiency and increase the risk of mistakes.

Rehabilitation aspects are among the leading elements in the psychological preparation of future specialists, including the development of psychological support programs after returning from high-stress zones to restore psychological balance and ensure mental health to prevent post-traumatic stress disorder [18].

Thus, comprehensive psychological preparation of future specialists in the security and defense sector is an important component of overall training for working in extreme conditions [19]. The development and enhancement of strategic thinking, stress resilience,

teamwork skills, and burnout prevention are fundamental factors in ensuring effective work in dangerous conditions while performing their duties. Therefore, regular training and psychological support should be an integral part of the preparation program for future specialists [20].

In our research, the control group (n=120) of future specialists underwent standard training without specialized additional exercises aimed at developing stress resilience and personal traits. The experimental group (n=120) of future security and defense specialists underwent specialized training using an experimental model for stress management, emotional self-control, and the development of psychological and psychophysiological resilience.

According to the data obtained during the experiment, it was found that the control group exhibited higher levels of anxiety, emotional sensitivity, and stress sensitivity, indicating limited ability to adapt to extreme conditions. Future specialists in the experimental group showed higher results (the majority of indicators statistically significantly improved compared to the control group at $p<0.05$) in emotional stability, self-control, cognitive functions, and optimism, demonstrating the effectiveness of training aimed at improving stress resilience and psychological readiness for working in high-stress conditions.

The results obtained in the study indicate that the experimental group, which underwent specialized training, demonstrated higher levels of self-control, emotional stability, and the ability to adapt to stressful situations, confirming the positive effect of the specialized program on the development and improvement of preparedness in extreme conditions.

The results highlight the need for and importance of special additional programs to improve emotional stability among future security and defense specialists, which will significantly enhance their ability to perform professional tasks under extreme conditions.

One of the key aspects of training future specialists is comprehensive preparation, with physical and psychological training being key elements. This ensures two important factors: readiness to perform various professional tasks and maintaining resilience during dangerous special operations or combat conditions. Given the current trends in the development of various technical tools and changing real threats, the need to improve psychological training methods aimed at effectively utilizing human potential becomes increasingly relevant [5].

The model presented in this work (Figure 2) demonstrates the evaluation of human potential based on cognitive functions and emotional-volitional resilience and visually represents the process of enhancing human capabilities through the integration of various methods for assessing emotional and cognitive reactions, specialized training, etc. The components of the model in the presented interpretation allow us to understand how various combined approaches to analysis and development can contribute to improving the overall ability of an individual to adapt to different conditions and enhance their efficiency and productivity.

The process of developing special skills within human potential occurs in three stages. The initial stage involves evaluating two main aspects: emotional and cognitive reactions of the individual. This initial assessment provides the foundation for further development, enabling an understanding of the factors on which efforts should be focused for improvement.

At the next, second stage, cognitive functions such as reaction speed and memory (e.g., mnemonic techniques or neuropsychological exercises) are trained. These are important elements in the development of human potential because they directly impact an individual's ability to adapt to various situations and achieve results in challenging extreme conditions. Such training operates in two directions: it improves cognitive abilities and promotes the development and enhancement of adaptive mechanisms in response to changing external circumstances.

A central aspect of human potential development is the stage of psychological adaptation, which includes implementing methods that reduce stress (stress and anxiety management training, mindfulness practices, which contribute to the development of operational thinking and improve emotional stability).

A critical stage in human potential development is the integration of cognitive ability training with psychological adaptation. By integrating these elements, an individual improves their cognitive functions while also effectively learning to manage emotions and purposefully adapt to new challenging situations.

The dynamic stage of assessing potential development through the analysis of emotional and cognitive reactions allows for the construction of an overall development strategy, where emotional balance and intellectual abilities play a leading role. This ensures a more stable result in human potential development, as it considers both emotional aspects and emotional abilities, which affect efficiency and productivity.

As a result, the components shown in the diagram of human potential development through adaptation and assessment represent a holistic approach, combining various methods of psychological adaptation training and cognitive abilities. This improves reaction speed, memory, increases adaptability, and enhances emotional resilience to various conditions, which are currently essential aspects for effective performance.

CONCLUSIONS

Developed cognitive functions (attention, memory, adaptability, decision-making speed, etc.) are crucial in the professional activities of future specialists in the security and defense sector under extreme conditions. The assessment of these functions through specialized methodologies is an essential component for determining their readiness to perform complex tasks in high-risk conditions.

Improving emotional-volitional stability and stress resilience through specialized training programs and psychological exercises is an important part of preparing future specialists. The results of the experimental research showed that the groups trained under the special program demonstrated better results with statistical significance at $p<0.05$ and 0.01 regarding concentration maintenance, fewer errors, and quicker recovery after stressful situations.

Taking into account the individual characteristics of the personnel (stress resilience, cognitive abilities, etc.) is essential for enhancing the effectiveness of psychological preparation. The development and implementation of individual training programs tailored to the specific needs of each specialist are necessary to achieve the best results in changing situations and high stress. Applying a comprehensive approach to psychological preparation for future specialists should include many components, namely: improving physical training, developing psychological flexibility, building individual stress management skills, and training cognitive functions and emotional stability.

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CONFLICT OF INTEREST
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