

PSYCHOLOGICAL FACTORS AFFECTING THE EFFECTIVENESS OF FIREFIGHTERS' PROFESSIONAL ACTIVITIES IN EXTREME CONDITIONS

*Yurii Karpenko*¹

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Abstract. The relevance of the study is determined by the increasing intensity and complexity of emergency situations, accompanied by high levels of psycho-emotional stress, risk to life, and the need for rapid decision-making, which highlights the need for an in-depth analysis of the psychological factors affecting the effectiveness of firefighters' professional activities. The purpose of the article was to scientifically substantiate the psychological factors of the effectiveness of firefighters' professional activities in extreme conditions. The research methodology was based on systemic, personality-activity, and comprehensive approaches using theoretical analysis of scientific sources, psychodiagnostic methods, expert assessment, correlation analysis (Pearson and Spearman coefficients), and methods of mathematical statistics. The empirical sample consisted of 186 firefighters and rescuers of the State Emergency Service of Ukraine with varying professional experience. The study found that the effectiveness of firefighters' professional activities is determined by the coordinated interaction of cognitive, motivational, emotional-volitional, regulatory, psychophysiological, and personal components of psychological readiness. It was found that risk readiness is not a determining factor in professional self-realization, but rather that motivational and regulatory characteristics of personality play a significant role. Data was obtained on the lowest level of formation of motivational and regulatory components of psychological readiness in firefighters, regardless of their length of service. The practical significance of the results lies in the possibility of using them to improve the system of professional and psychological training of firefighters, develop psychological support programs, preventing professional burnout, and increasing the effectiveness of fire and rescue units in emergency situations.

Keywords: rescuer, emergency situation, professional burnout, risk, emotional and volitional sphere.

¹ ORCID: <https://orcid.org/0009-0004-4725-9420>
Independent Researcher,
Technical Specialist in Fiberglass and Composites, US

Introduction

The relevance of researching psychological factors affecting the effectiveness of firefighters' professional activities in extreme conditions is determined by the increasing intensity and complexity of emergencies of a technogenic, natural, and military emergencies, which are accompanied by an increased risk to life, a high level of uncertainty, and significant psycho-emotional stress on the personnel of fire and rescue units. Firefighters' professional activities take place in conditions of time constraints, threats to life, the need to make quick and responsible decisions, and perform complex coordination actions, which places increased demands not only on physical training and technical equipment, but also on psychological resilience, adaptability, and the ability to self-regulate.

At the same time, in the practice of civil protection services, there is a contradiction between the the objective need to ensure high efficiency of firefighters' professional activities in extreme conditions and the insufficient level of consideration of psychological factors that directly affect the effectiveness of actions, personnel safety, and mental health [1]. Often, the emphasis is placed on regulatory, organizational, and technical aspects of the activity, while individual psychological characteristics, stress resistance, emotional regulation, motivation, and cognitive processes remain outside the scope of systematic analysis or are considered only fragmentarily [2]. This determines the relevance of a comprehensive analysis of psychological factors of effectiveness with the aim of scientifically substantiating directions for improving professional training, psychological support, and a system for preventing negative psychological consequences in the activities of firefighters.

Literature Review

In contemporary scientific discourse, psychological factors affecting the effectiveness of firefighters' activities are predominantly revealed through the consequences of chronic stress and traumatic experiences which affect the reliability of professional behavior in extreme conditions. In particular, in samples of volunteer firefighters, T. Schnell, F. Suhr, and R. Weierstall-Pust [1] emphasize that the risk of developing post-traumatic symptoms increases when intense traumatic exposure is combined with a lack of recovery and support resources, while protective factors (individual and social) can significantly “mitigate” the negative effects of service. It is also important that these results actually lead to the conclusion that the effectiveness of activities cannot be explained solely by the “presence/absence” of traumatic events, but depends on how the professional adapts psychologically and recovers after extreme episodes. Along with this, data on high-risk exposure confirm that post-traumatic reactions in firefighters can be combined with a wider range of psychopathological manifestations that complicate cognitive regulation, emotional stability, and, as a result, accurate decision-making under pressure.

A significant body of research focuses on the links between individual psychological traits, emotional regulation, and symptoms of anxiety/depression, which directly undermine professional resilience in hazardous environments. For example, Y. Tao et al. [2] showed that emotional regulation strategies may be the key link that explains why certain personality characteristics are associated with more pronounced or, conversely, weaker manifestations of anxiety and depression in firefighters. This means that in order to increase the effectiveness of activities, the priority is not to “fix” personality traits as a given, but to develop regulatory skills that reduce emotional overload. At the macro level, the results of population surveys also emphasize that psychological difficulties among firefighters are not isolated cases, but are systemic in nature and require targeted institutional decisions in the field of mental health support. This is precisely the picture painted by M. T. Wolfe et al. [3] for the context of Great Britain, pointing to the prevalence of mental health problems that may be related to workloads and occupational risks.

A separate group of studies details the mechanisms of transition from subjectively experienced stress to professional burnout, which is critically important for explaining the decline in performance under extreme conditions. G. Lv, J. Li, and Q. Xu [4] showed that perceived stress can “fuel” burnout not directly and linearly, but through the interaction of psychological links that amplify or weaken this effect, i.e., the risk of exhaustion depends on a combination of several factors, not on a single parameter. At the level of evidence systematization, J. J. García-Iglesias et al. [5] summarize that burnout in firefighters is associated with a complex of prerequisites (organizational, operational, and psychosocial) that accumulate and increase vulnerability to exhaustion, which directly threatens the reliability of task performance. This logic is supported by N. A. Choudhury et al. [6], who emphasize that stressors in the fire service are of various natures (individual, professional, environmental), and their combined effect creates the preconditions for psychological breakdowns and a drop in productivity in critical situations. At the same time, traumatic events involving human casualties are a particularly powerful trigger: T. Görlich et al. [7] demonstrate that after operations involving the death of team members, firefighters may experience increased post-traumatic symptoms and emotional reactions (particularly anger), which complicate recovery and may reduce functional stability in further service.

Despite the significant amount of research, there are still gaps in the scientific literature that are critical to the topic of psychological factors affecting the effectiveness of firefighters' professional activities in extreme conditions. The results of many studies focus on symptoms (PTSD, anxiety/depression, burnout) or on individual resources, but rarely integrate these findings into a comprehensive model of psychological preparedness as a multi-component system (cognitive, motivational, emotional-volitional, regulatory, communicative, and psychophysiological) in connection with the effectiveness of actions in real extreme situations.

The purpose of the article was to theoretically substantiate and generalize the psychological factors that determine the effectiveness of firefighters' professional activities in extreme situations.

Research Results

The professional activities of firefighters and rescue workers are inherently associated with constant exposure to increased risk, high levels of psychological and emotional stress, and the need to perform tasks quickly under conditions of time constraints, incomplete or uncertain information, and significant responsibility for the consequences of decisions made [3]. These specific features of the service determine the special requirements for the psychological readiness of firefighters and their ability to act effectively in extreme conditions. From a psychological point of view, performing tasks in emergency situations is accompanied by the influence of a wide range of unfavorable, uncomfortable, and threatening factors that negatively affect the mental state of personnel. Specialists involved in emergency response and rescue operations are under double pressure – both psychological and physical – which increases the risk of developing stress conditions, mental maladjustment, and neuropsychiatric disorders, as well as posing a direct threat to their health and life. Prolonged or intense exposure to extreme factors often leads to a decrease in professional efficiency, impaired performance, and the emergence of negative behavioral manifestations, including interpersonal conflicts, disciplinary violations, and maladaptive ways of coping with stress. Stress factors such as the inability to save victims, the death or injury of children, colleagues, or civilians, as well as visual images of victims, are of particular psychological significance for firefighters [2]. These factors are characterized by high emotional intensity and irreversible consequences, which significantly increases their traumatic potential.

The most psychologically vulnerable situations are those involving the loss of human life, which can provoke feelings of guilt, helplessness, emotional exhaustion, and a decrease in overall activity in firefighters and rescuers [4]. In such conditions, specialists tend to internalize responsibility for events that are beyond their actual control, which further complicates the process of psychological adaptation. Along with this, the list of stressors also includes high responsibility for decisions made, constant threat to life and health, the need to act quickly under time constraints, the suddenness and unpredictability of events, as well as the influence of specific environmental conditions – fire, smoke, toxic substances, noise, and vibrations. At the same time, these factors are largely integrated into the usual professional context of firefighters' activities, which may reduce their subjective significance compared to events involving human casualties. The combined impact of these stress factors complicates the performance of official duties, negatively affects the physical and mental state of firefighters, and, as a result, reduces the effectiveness of their professional activities. In the course of performing their duties, firefighters and rescuers most often experience states of psycho-emotional arousal, pronounced fatigue, fear, and frustration, accompanied by disturbances in cognitive processes, emotional regulation, and motor reactions [8, p. 613].

Brainer K. et al. [9, p. 518], with the aim of in-depth analysis of the psychological characteristics of the professional activities of firefighters, the interrelationships between the level of risk readiness (according to the methodology of G. Schubert) and professional self-realization (according to the methodology of K. Gavrilova) using Pearson's correlation coefficient. The results showed a weak direct relationship between these indicators, which does not reach the level of statistical significance ($r = 0.18$; $p > 0.05$). This indicates that within the studied sample of SES employees, risk readiness is not a determining factor of professional self-realization and does not form a stable psychological basis for professional effectiveness. The absence of a significant connection suggests that the professional self-realization of firefighters is largely mediated by other psychological variables, in particular, motivational attitudes, level of professional identity, value-meaning orientations, and personal maturity [9, p. 518]. In this context, risk can be viewed as a situational or external factor of professional activity, rather than an internal psychological characteristic that directly determines success and fulfillment in the profession.

At the same time, the analysis of socio-psychological parameters revealed statistically significant correlations between risk readiness and indicators of social responsibility. In particular, a negative correlation was found between the presence of minor children and the level of risk-taking ($\rho = -0.28$; $p < 0.05$). This indicates that parenting creates additional psychological constraints on risky behavior, emphasizing the priorities of safety, stability, and preservation of life in high-risk professional situations. The relationship between risk-taking and the presence of financially dependent persons ($\rho = -0.25$; $p < 0.05$), which confirms the importance of external social obligations in regulating the professional behavior of firefighters. In this case, social pressure acts as a factor that modifies the subjective perception of risk and influences the style of decision-making in extreme conditions. Along with this, a moderate positive relationship was established between the presence of minor children and the level of professional self-realization ($\rho = 0.23$; $p < 0.05$). This result can be interpreted as a manifestation of the motivational resource of parenthood, which strengthens the desire for professional growth, responsible performance of official duties, and awareness of the social significance of the professional activities of firefighters in high-risk conditions [9, p. 518].

An analysis of the characteristics of firefighters' professional activities suggests that their effectiveness is determined by the coordinated interaction of cognitive, emotional volitional, motivational, psychophysiological, and personal components (Table 1). Disruption of any of these components under conditions of excessive psycho-emotional stress leads to a decrease in the quality of professional actions, increases the likelihood of errors, and raises the risk to

the life and health of personnel. It has been established that the predominance of situations involving time constraints, information uncertainty, and immediate threats to life has a negative impact on mental processes, particularly attention, thinking, and memory, which requires a high level of development of skills in operational analysis, forecasting, and decision-making. At the same time, emotional tension caused by contact with traumatic events and human losses highlights the need for emotional stability, self-control, and voluntary regulation of behavior. The motivational sphere of firefighters is an important internal resource for overcoming professional difficulties and ensures the preservation of professional activity in conditions of extreme stress [10, p. 56]. At the same time, prolonged exposure to negative psychogenic factors without an adequate system of psychological support contributes to the development of fatigue, professional burnout, and personality deformations, which reduces the level of professional efficiency.

Table 1 – Structure of psychological readiness and stress factors in the professional activities of firefighters in extreme conditions

Components of psychological readiness	Substantive characteristics	Extreme factors of professional activity	Psychological manifestations and consequences of influence	Functional significance for the effectiveness of activities
Cognitive component	Ability to analyze the situation, predict the development of events, make decisions in conditions of information and time deficit	Poor visibility, smoke, noise, sudden changes in the situation, lack of time	Decreased concentration, slowed thinking, increased likelihood of wrong decisions	Ensures adequate risk assessment, correct choice of tactics, prevention of fatal mistakes
Emotional and volitional component	Ability to control oneself, emotional stability, overcoming fear, anxiety, and panic	Fire, threat to life, death or injury of people and colleagues, sight of victims	Fear, anxiety, guilt, emotional exhaustion, frustration	Supports mental stability, prevents disruptions in activity, ensures the completion of tasks in critical conditions
Motivational component	Professional focus, awareness of the social significance of activities, readiness to act in risky situations	High responsibility for human lives, material values, social pressure	Increased or decreased internal motivation, professional burnout or mobilization of resources	Promotes the preservation of professional activity, perseverance, and responsibility

Psychophysiological component	Functional state of the nervous system, endurance, working capacity, ability to withstand prolonged stress	High temperature, heat radiation, physical exertion, work in PPE	Fatigue, impaired coordination, decreased reaction speed, exhaustion of resources	Ensures physical reliability of activities and ability to work in extreme environments
Communication component	Ability to interact effectively, interchangeability, coordinated actions within a unit	Panic behavior of the population, isolation, communication breakdown, limited space	Conflict, disorganization of interaction, feeling of isolation	Supports team cohesion and coordination of actions in complex situations
Regulatory component	Ability to self-regulate mental state and behavior in extreme conditions	Prolonged stress, lack of time, need to act in a gas mask	Maladjustment, reduced self-control, impulsive actions, or refusal to act	Ensures the preservation of behavioral control and stability of activity
Personal component	Personality stability, adaptability, responsibility, willingness to take risks	Long-term psychotraumatic situations, repeated extraordinary events	Changes in personality structure, professional deformation, decreased stress tolerance	Determines long-term professional reliability and ability for self-realization

Source: compiled on the basis of [10; 11]

Therefore, the psychological characteristics of firefighters' professional activities in extreme conditions necessitate a systematic approach to the formation of psychological readiness, which involves the targeted development of cognitive, emotional-volitional, motivational, and regulatory components. The implementation of comprehensive psychological training and support programs is a necessary condition for maintaining professional health, increasing the effectiveness of activities, and ensuring the safety of personnel in emergency situations.

The professional activities of firefighters in extreme conditions place increased demands not only on physical training, but above all on the psychological readiness of the individual. The modern human-centered model of education is focused on developing the ability of specialists to act in high-risk situations, where there is a lack of time, information uncertainty, and constant threat to life. Therefore, the training of future rescuers should ensure the development of stable thinking, self-control, responsibility, and the ability to make informed decisions in extreme situations. The psychological readiness of firefighters is formed through a systematic combination of scientifically based knowledge and practical experience. The consistency and accessibility of training contribute to gradual adaptation to the stress factors of professional activity, while the close connection between theory and practice allows for the consolidation of skills in real and simulated emergency situations. It is during practical

training that attention, reaction speed, emotional balance, and resistance to psycho-emotional stress are developed. Taking into account the individual psychological characteristics of future firefighters plays an important role [12, p. 98]. An individualized approach combined with group training contributes to the formation of cohesion, mutual support, and effective team interaction. Control of emotional states, development of stress resistance, and the ability to maintain professional reliability in critical conditions are key factors for the effective and safe activities of firefighters during emergency response.

In conditions of social instability and an increase in the number of emergencies, the training of specialists in the psychological service of the State Emergency Service of Ukraine, whose activities are directly related to the support of firefighters in extreme conditions, is of particular importance. supporting firefighters in extreme conditions. The effectiveness of their professional activities is largely determined by their level of psychological readiness, which is a key indicator of the quality of professional training and combines the learning process with the real challenges of the service. Psychological readiness in this context is seen as a stable positive attitude towards future professional activity, the ability to act confidently, responsibly, and effectively in situations of increased risk, emotional stress, and uncertainty. It is this attitude that ensures the successful professional self-realization of SES psychologists and their ability to maintain the mental stability of firefighters during emergency response operations. In this regard, there is a growing need for high-quality training of future psychologists of the State Emergency Service based on an integrated approach that combines fundamental theoretical knowledge, practical professional skills, self-regulation and self-learning skills, as well as a developed psychological awareness [13, p. 158]. The development of psychological readiness of such specialists is a necessary condition for effective psychological support of the professional activities of firefighters in extreme conditions and ensuring the reliability of the functioning rescue units in general.

Experiencing dangerous situations in the professional activities of firefighters is not necessarily accompanied by disorganizing fear or mental paralysis. With developed volitional and personal qualities – activity, initiative, courage, inner composure – danger can, on the contrary, mobilize the specialist's internal resources. In such conditions, there is an increase in mental tone, sharpening of analytical thinking, rapid generalization of information, and an increase in readiness for active action. For firefighters, extreme situations often become an experience of intense professional self-realization, which is perceived as meaningful, emotionally intense, and even motivating. Such experiences are engraved in memory as vivid professional moments that strengthen confidence in one's own abilities and form a sense of professional competence [14, p. 178]. In this regard, systematic diagnosis of the professionally important psychological qualities of employees of the fire and rescue service of the State Emergency Service of Ukraine is particularly relevant. It allows for the timely identification of individual characteristics that require targeted development or psychological correction in order to increase the effectiveness of activities and maintain mental stability in conditions of constant risk.

In this regard, there is a growing need not only for diagnostics, but also for a thorough scientific analysis of the level of psychological readiness of firefighters and rescuers of the State Emergency Service of Ukraine to operate in extreme conditions. It is in this context that a study was conducted on the level of development of the structural components of psychological readiness among firefighters. The study involved 186 firefighters and rescue workers of the State Emergency Service of Ukraine from the Luhansk, Kharkiv, Sumy, Ternopil, Khmelnytskyi, Dnipropetrovsk, Donetsk, Kirovohrad, and Kyiv regions, who were divided into three groups depending on their professional experience: group A – up to 3 years of experience (64 people), group B – from 3 to 5 years (70 people), group C – over 5 years (52 people). The expert group consisted of 36 people, including watch commanders, heads of fire and rescue units, and psychologists from the State Emergency Service. The criteria for

assessing psychological readiness were based on five interrelated components: motivational, volitional, regulatory, typological, and cognitive. The results of the analysis showed that the least developed components were motivational (3.3 points) and regulatory (3.8 points). The volitional (4.9 points) and typological (5 points) components have an average level of development, while the cognitive component is characterized by a high level of development (5.2 points) [15, p. 8].

The low level of development of the motivational component in groups A, B, and C reflects a neutral or negative attitude toward professional activity, as well as a weak desire to achieve success and self-realization. The insufficient development of the regulatory component in firefighters-rescuers in groups A and B indicates limited self-regulation capabilities, difficulties with emotional control in extreme situations, reduced ability to resist stressors and mobilize their own resources. Statistically significant differences ($p \leq 0.05$) were found between groups A and B in terms of the severity of professional motives. With increasing length of service (groups B and C), there is a transformation of the leading motives of professional activity and a restructuring of their hierarchical structure. Analysis of the typological component showed that the level of neuropsychological stability in representatives of groups A (6.2 points) and B (5.2 points) is sufficient, however, prolonged exposure to stressors can lead to the development of negative mental states. At the same time, firefighters and rescuers in group C demonstrate minimal susceptibility to breakdowns due to high adaptability and endurance of the nervous system. Research into the volitional component has shown that specialists with more than 5 years of experience are distinguished by a higher level of independence, perseverance, self-control, and socially positive orientation compared to employees in groups A and B. At the same time, with an increase in the length of service in the State Emergency Service, there is a decrease in certain cognitive indicators—mental activity, concentration, and attention flexibility, which is due to the constant responsibility for people's lives and the chronic influence of extreme factors of activity. Analysis of the regulatory component confirmed that the level of planning, modeling of operating conditions, programming of actions, and evaluation of results directly depends on practical experience. The accumulation of professional experience contributes to an increase in the level of conscious self-regulation of the personality. The generalized results of the study confirm the expediency of the purposeful development of the psychological readiness of firefighters and rescuers of the State Emergency Service of Ukraine, primarily the motivational and regulatory components, the level of development of which remains insufficient for effective action in extreme conditions [15, p. 10].

It has been established that with increasing length of service, the hierarchy of professional motives changes, the level of volitional regulation and neuropsychological stability increases, which contributes to a decrease in the likelihood of disorganization of activities in extreme conditions. At the same time, the prolonged influence of stressful factors in professional activity causes a gradual decline in certain cognitive indicators, which requires the implementation of psychological support and prevention of professional burnout. The data obtained confirm the need for systematic psychological support for firefighters and rescuers of the State Emergency Service of Ukraine, in particular, the targeted development of motivational and regulatory components of psychological readiness. This justifies the use of specialized programs for the formation of psychological readiness as an important condition for increasing the effectiveness of professional activity, maintaining mental stability and reliability of actions in conditions of constant risk.

Conclusions

The study found that the professional activities of firefighters in extreme conditions are characterized by high levels of psycho-emotional stress, constant threat to life, time

constraints, and informational uncertainty, which objectively increases the requirements for the psychological readiness of personnel. The cumulative effect of stressors, in particular those associated with human losses, traumatic visual images, and responsibility for decision-making, significantly complicates mental processes and can negatively affect the effectiveness of firefighters' professional activities. It has been established that the effectiveness of professional activities in extreme conditions is determined not by individual psychological characteristics, but by the integrated interaction of cognitive, emotional-volitional, motivational, psychophysiological, communicative, regulatory, and personal components of psychological readiness. Disruption of any of these components in conditions of excessive psycho-emotional stress increases the likelihood of wrong decisions, disorganization of activities, and professional failures.

It has been established that with increasing professional experience, there is a transformation of the leading motives of activity, an increase in the level of volitional regulation, nervous and mental stability, and adaptability to stress factors. Firefighters with long-term service experience demonstrate a higher capacity for self-control, perseverance, and professional reliability, which reduces the risk of maladaptive reactions in emergency situations.

The results obtained confirm the expediency of a systematic approach to the formation of psychological readiness of firefighters, which should combine the purposeful development of the motivational sphere, self-regulation skills, emotional stability, and volitional qualities with practical training in conditions close to real extreme situations. The implementation of comprehensive psychological training and support programs, as well as improving the quality of training for specialists of the psychological service of the State Emergency Service of Ukraine, is a necessary condition for maintaining professional health, increasing the effectiveness of activities, and ensuring the safety of fire and rescue units in the current conditions of an increasing number of emergencies.

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