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**INTEGRATIVE LEARNING TECHNOLOGIES FOR
PSYCHOLOGICAL AND PHYSIOLOGICAL SUPPORT FOR
PROFESSIONAL FIREFIGHTERS**

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Abstract

This study provides results showing the impact of an integrative psychology and psychophysiology program on risk-taking and locus of control of firefighters. Blending proficiency training programs combines coaching, lectures, seminars, individual counseling and uses off-line and online tools. It includes “creative visualization”, “autogenic training” and a set of physical exercises that help maintain subjective well-being and contributes to the professional development of firefighters. According to the post-survey, the coaching allowed for significant changes in the measured variables: risk-taking, the locus of control, in subjective well-being and job satisfaction. Initially, data cluster analysis identified the risk group in a sample of firefighters. The main characteristic of the group was extreme score values of risk-taking and external locus of control. The risk-taking decreased to the average values and the external locus of control was significantly decreased too after participating in the program “Psychology and Biomechanics of Human System”. The program had an impact on self-estimation of cognitive abilities such as memorizing, paying attention, and dealing with complex analytical problems, decision making in their professional and personal life, according to post-survey. The originality of the program is in systematic support using IT technologies, structured feedback, and involvement of the patient in the creation of the methodology by himself under leadership coaching. The high degree of individualization is a predictor of success. Our system may be useful for other hazardous and high-performance occupations.

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1. Introduction

Modern educational technologies are focused on becoming a professional and supporting professional development. Specialists in the leadership of employees, in the human resources department often independently, get the necessary skills, competencies, knowledge for effectiveness in their profession, in the industry as well as professional and personal development. The formation of an individual trajectory of professional development on the basis of supporting competence and skill courses becomes particularly relevant in the professions associated with the risk to life, safety, and rescue.

A high level of stress load means that support is critical for mental health and job performance, but cultural stereotypes make it difficult to ask for help in time. For example, firefighters are regarded as invulnerable, many feel embarrassed to ask for help, and available programs can be difficult to navigate (Muller, 2018). A program in the mode of training and individual coaching can help support mental health and provide additional resources for the initial appeals of firefighters for psychological help. Researchers note that social support and attitudes towards psychological support in training have a positive effect on firefighters and even reduce the severity of symptoms of psychological trauma and post-traumatic stress (Gemma, 2018; Stanley et al., 2018). Explicating human potential in hazardous occupations requires social, psychological and educational support (Karabin & Pryazhnikova, 2018).

In general, the programs that integrate training and coaching, implemented online and offline can solve the problems in maintaining professionalism and mental health. The research is dedicated to evaluating the effectiveness of one such program for firefighters in Russia.

2. Problem Statement

The main goals for firefighters training in Russia are technical competencies and a high operating speed. Open published programs from the Ministry of Emergency Situations, Federal Firefighters Service of Russia are about difficult skills, main examples: Universal interactive training complex of fire extinguishing equipment MKU-03, “Interactive simulator of fire extinguishers”, training complex “Thermal Smoke Chamber”, includes modules: orientation module “Labyrinth”, Module “Construction Crash”, Module “Memory”, Module “Industrial Zone”, Module “Bandage”, Module “System of Contact Floor”, Module “Hook-hammer”, Module “Infinite staircase”, “Treadmill” module, fire ground “Lava”, “Industrial site”, “Residential zone”, “Console compartment”. Training on all these modules actively connects cognitive processes, systems of self-regulation and physical activity (Subachev & Subacheva, 2008; Zavod spetsial'nogo oborudovaniya «PTS», 2019). At the same time, cognitive or regulatory programs are not enough.

On one hand, the psychology of firefighting and quality of mental performance are significant for professional development and subjective well-being of firefighters (Jahnke, Poston, Haddock, & Murphy, 2016; Wheldon, 2019). On the other hand, cognitive recourses, such as IQ and implicit learning are very important for high-performance occupations (Kostrikina, 2013). The specificity of programs for firefighters is determined by cognitive parameters (Brown, Mulhern, & Joseph, 2002), values and motivational features (Skorkin, Karabin, & Kostrikina, 2014), psychological skills and knowledge (Gnacinski, Ebersole, Cornell, & Mims, 2015). Researchers note the need to take into account personal

and individual characteristics in the therapy and training of firefighters (Psarros et al., 2017). In general, the parameters for employee selection in hazardous and high-performance occupations have much in common (Salgado, 2017; Schmidt, Oh, & Shaffer, 2016).

We chose integrative indicators that are relevant to hazardous occupations, assess subjective well-being, and review the self-assessments of cognitive processes.

3. Research Questions

This study considers the following issues:

- Influence training and coaching program on psychological indicators of professional firefighters' activity. These are indicators such as risk-taking and locus of control.
- The opportunity of the program to improve self-assessment of job satisfaction, cognitive abilities and physical abilities.

The practical significance of the research is further enhanced by the fact that the degree of risk is not reduced but is transformed into new forms in the modern technogenic world, despite the progress of safety and rescue technologies.

Programs in which the coach conducts an individual development plan through lectures, physical training, professional skills, and complex individual work on self-suggestion, creative visualization, and individual physical activity may be useful for firefighters and other high-risk professionals, or business professionals of various high -performance occupations.

4. Purpose of the Study

is proving the influence of a specialized program on the indicators of risk-taking and locus of control, subjective self-assessments of general well-being and cognitive processes.

5. Research Methods

1) "The level of subjective control" (a version of the method of "Locus of Control" by J. Rotter (adaptation by Bazhin, Golyukina, & Etkind, 1984, p. 154);

2) Questionnaire to measure the level of empathic tendencies.

3) The scale of subjective job satisfaction.

4) The scale of emotional discomfort.

4) Questionnaire on "Risk-taking level";

5) Self-assessment survey of physical condition, physical abilities, self-assessment of and cognitive abilities (concentration and switching of attention, the effectiveness of memory, speed and accuracy of decision making).

The results of measurement were processed by ANOVA analysis of variance, and cluster analysis) using IBM SPSS mathematical statistical packages, Statgrafics Centurion, Exel.

The study was conducted from 2012 to 2018 on the basis of the Federal State Budgetary Educational Institution of Higher Professional Education "Moscow Training Center Federal Firefighting Service".

The sample consisted of 123 people – a student of the Training Center, age – from 20 to 52 years, the majority being males (only 9 women in the entire sample). The experiment involved groups of ordinary and junior commanding personnel (63 people, age from 21 to 37, the average length of service – 1.2 months) as well as officers (60 people, age from 23 to 42, the average length of service – 6.7 years).

6. Findings

The low level of job satisfaction across the entire sample of subjects served as a starting point for testing the “Psychology and Biomechanics of Human System” program. According to Figure 1, only 71.5 % of all respondents were completely satisfied and the majority of these, officers. These results reflect the difficulties both groups face (officers and privates) doing excellent work, often at the risk of their lives. Respondents with low job satisfaction accounted for 28.5 % (Fig. 01). This group demanded special attention during the program

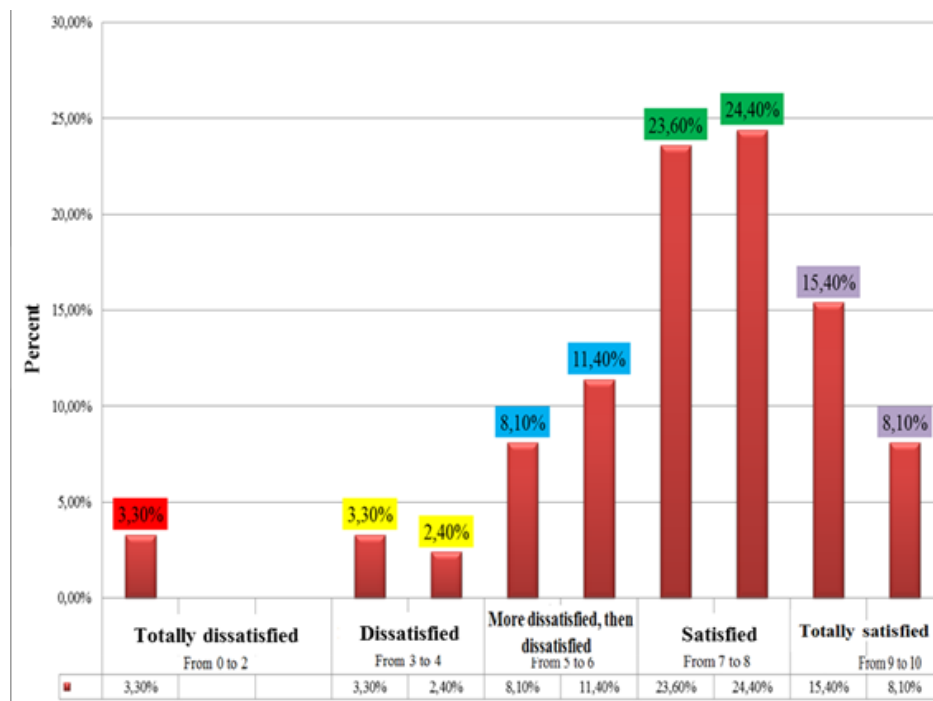


Figure 01. Job satisfaction

The results of cluster analysis reveal the essence of the propensity to take risks as a parameter associated with a focus on external factors, such as luck, favorable circumstances, the promotion of others, and the like, that is, externality (Fig. 02). Figure 02 shows how the studied traits are combined. As a group with problems, we identify the second cluster consisting of officers and privates who have a high level of risk appetite and external control locus. Representatives of the first cluster have average risk-taking; however, they can demonstrate problems in professional development, due to the pronounced external locus of control. The third safe cluster includes only officers, i.e. it did not include the privates.

The advantages of cluster analysis as a data processing method are manifested in the fact that a psychologist or educational practitioner can form holistic subgroups of participants for remedial and advisory work and monitor each participant in the training process accordingly.

The integrative training and coaching program for firefighters “Psychology and Biomechanics of the Human System” was conducted at risk – 30.97 % of the primary sample.

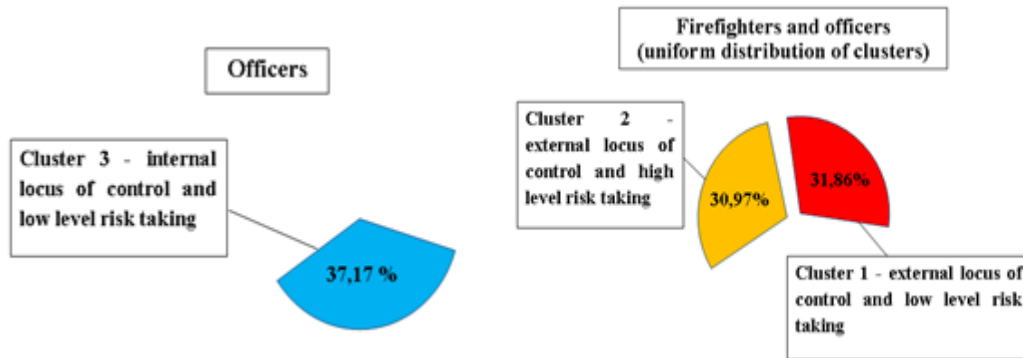


Figure 02. Grouping by the locus of control and risk-taking

The group consisted of 18 ordinary firefighters, and 20 officers. The values of cluster centroids by the parameter propensity to risk – 10.17; externality – 50.42. Subjects shown to be Questioning of self-assessment of cognitive properties (attention, operational memory, speed and accuracy of performance) and parameters of emotional discomfort, job satisfaction showed a negative character. The subjects of this cluster rated their qualities poorly, were not satisfied with the work, and experienced emotional discomfort.

Repeated measurements were carried out 3 months after passing the training part of the program and in the process of continuous coaching. The values of the cluster centroides amounted to a risk tendency of 9.8, the locus of control is 32. We observed significant changes in the locus of control as well as risk taking.

Significant differences were found in measurable indicators before and after passing the program. Mean values in dependent variables with statistically significant differences (GLM, SPSS):

- locus of control – 29;
- risk-taking – 7.2.

Self-estimation parameters:

- arbitrary influence on its respiration rate, heart rate – 6.7;
- arbitrary mobilization of physical capabilities – 8.3;
- paying attention in tasks when performing extinguishing tasks – 7.6;
- speed and accuracy of actions in occupational situations and in life – 8.6;
- improvement in attention , focusing, and switching – 7.9.

Scales:

Subjective job satisfaction – 9.2.

Subjective emotional discomfort – 7.2.

The influence factor of the program turned out to be significant in the listed parameters, while the professional category to which subjects belong, officers or privates, did not show a significant effect on the mean values.

Analysis of feedback from the passage of the program showed the involvement and positive perception of firefighters of this impact. In particular, 84 % of the subjects noted that they were resolving their questions related to a negative emotional state, depression, which would not have been asked to specialists outside the program and would not have taken initiative for external help. The program provided them with opportunities to handle their questions. Only 24 % indicated that it was very difficult to find additional time for classes, but they managed. The entire group that has completed the program is ready to continue further and to involve family members or relatives in physical training in mastering visualization techniques. The participants noted the special attractiveness and significance of real, off-line lessons, along with the possibility of communicating with a coach via instant messengers. 84 % of respondents identified coaching as the most attractive tool for the development of psychological knowledge and techniques, e.g. comprehensive coaching of physical activity, autogenic training, communication, and visualization to achieve mental well-being is rated by respondents to a maximum of 9.10 points. The participants (96 %) would like more feedback on their opinions and assessments of lectures, more systematic external monitoring of their performance of autogenic and physical training and visualization.

7. Conclusion

A fundamentally new integrative program has been proposed that combines the methods and tools of e-learning, coaching, and classical methods of learning. The program is implemented in a comprehensive manner from training courses (lectures, seminars) to individual counseling, a group training system and a physical training system. The coach supports the fireman on a schedule based on acceptance of the fire request and feedback on the passage of the program. An app can be created for the program.

The program for firefighters “Psychology and Biomechanics of the Human System” has an impact on both firefighter professional groups, officers and privates, while the privates are more in need of this program, because initially the groups of privates that were carriers of negative quality patterns are quantitatively higher. These patterns are high risk-taking, high internality, low job satisfaction, low self-esteem of cognitive and physiological qualities.

The impact of technologies of autogenic training, creative visualization and individual sports training on subjective assessments of cognitive abilities, a physiological state in the future should be confirmed by an objective registration of psychological and physiological parameters. The impact of the program on the parameters of the locus of control as well as risk-taking and job satisfaction confirms the practical significance of the program for firefighters.

The proposed technologies contribute to the formation of an informational basis for the activities of firefighters and also contribute to the formation of a system of professionally important qualities of these specialists.

The programs and methods developed by us can be used to relieve physiological stress, increase awareness of behavior and internal control, adequate risk attitudes for specialists in other professional fields and in various spheres of life. Thus, the study requires its continuation in various professional groups.

The using of cluster analysis data can be useful for the formation of training and advisory groups. It allows more accurately tracking the dynamics of indicators for working groups. This method allows us to objectively segment the database of employees serving by the suggested criteria. We suggest using the clustering method to monitor the mental and physiological status of firefighters or other specialists.

The program will be developing based on feedback from the participants and system external measurements of risk-taking, control locus, and cognitive parameters.

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