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MODERN METHODS OF INCREASING PHYSICAL PREPAREDNESS INDICATORS AND TRAINING CADETS AND STUDENTS FOR EXTREME SITUATIONS

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Abstract
This article scientifically analyzes modern methods for enhancing the physical preparedness of cadets and trainees and preparing them for effective action in extreme situations. The research highlights the significance of interactive sessions, innovative technologies, virtual training, exercises that develop stress resilience, and psychophysiological preparation. The results of conducted experiments demonstrate that modern approaches improve physical indicators by 15-25%, increase stress resistance, and optimize speed of action in extreme situations. The article provides scientific and practical recommendations for implementing advanced technologies in the process of training cadets and trainees.

Keywords: Physical fitness; cadets; trainees; extreme conditions; resilience; stress management; modern training methods; virtual reality (VR); biometric monitoring; psychophysiological preparation; endurance; situational awareness; adaptive training; physical performance; emergency readiness.

Introduction

In the modern world, the level of physical and psychological preparedness of specialists serving in military, law enforcement, and security systems plays a crucial role in ensuring state defense and national security. In today's rapidly changing global environment fraught with risks, the ability to act appropriately in extreme situations, make quick decisions, and maintain stability under stress is considered one of the criteria for professional readiness of every cadet and trainee.

While traditional physical education and training systems primarily focus on developing strength, endurance, and agility, modern requirements necessitate a broader approach to organizing this process. The real extreme situations that arise in contemporary security systems demand not only physical strength but also mental stability, stress resilience, analytical thinking, rapid adaptability, and volitional qualities. Therefore, limiting the process of physical preparation to traditional exercises alone does not fully meet the demands of the present era.

The use of innovative training technologies, virtual simulation systems (VR), biometric monitoring tools, stress-test exercises, and psychophysiological preparation methods is

yielding effective results in improving the training process of cadets and trainees. With the help of these tools, training is tailored to the individual's physical capabilities, the educational process is organized in an environment closely resembling extreme conditions, and as a result, the skills being learned are developed in a manner that closely approximates real service conditions.

In recent years, the integration of physical and psychological training in the military education system, as well as the implementation of a comprehensive assessment system for cadets, has gained crucial importance. This necessitates not only imparting theoretical knowledge in the educational process but also developing practical skills and cultivating a culture of self-control and safe movement in extreme situations.

From this perspective, enhancing the physical fitness indicators of cadets and students and preparing them for extreme situations is scientifically and practically relevant. The main objective of this research is to scientifically substantiate modern methods used to improve the physical fitness of cadets and students and prepare them for effective performance in extreme conditions, to determine their effectiveness through experimentation, and to implement them in the educational process.

The relevance of this research lies in its proposal of a comprehensive system of physical preparation that encompasses not only strength and endurance, but also factors such as psychological stability, stress adaptation, rapid analytical skills, and coordination. Furthermore, this approach serves to elevate not only the physical potential of cadets and students but also their level of professional readiness to a new stage.

Methods

1. Research Design.

The research was conducted using an experimental, randomized controlled design. Participants were randomly assigned to either the experimental group (which received an innovative training package) or the control group (which continued with traditional training). Measurements were taken in three stages: initial (baseline), intermediate (6th week), and final (12th week). Additionally, a 6-month follow-up was planned to assess the sustainability of the results.

2. Participants.

Population: Cadets admitted to a military educational institution and students in professional training courses.

Sample size: total n = 180 (120 cadets and 60 students). Participants were equally divided into two groups: the experimental group (n = 90) and the control group (n = 90). The distribution was carried out using stratified randomization (based on cadet/student status), maintaining the ratio of cadets to students in each group.

Entry and eligibility criteria:
Entry criteria: Individuals aged 18-30 who are medically cleared for participation and have provided written consent.

Restriction: serious cardiovascular diseases, recently operated on, deemed unfit for training due to physical or mental health reasons.

3. Intervention.
A 12-week comprehensive training package was developed for the experimental group. The package consists of three main components: physical training, virtual extreme simulations (VR), and psychophysiological/psychological training.

A. Physical training.
Duration: 12 weeks; 5 sessions per week (4 physical workouts + 1 recovery/light exercise).
Type and content of training: 3 sessions per week of high-intensity interval training (HIIT) and plyometric exercises (for strength and explosiveness). The duration of each session is 45-60 minutes.
Once a week, a 60-minute session focusing on endurance (long-distance running, tempo variations) and coordination exercises.
One weekly recovery session (mobilization, light aerobic exercise, and breathing exercises) - 30-40 minutes.

B. Virtual Reality (VR) Simulations.
Number of sessions: twice a week, each lasting 30-40 minutes.
Scenarios: movement at heights, navigation in limited visibility and smoky environments, performing team tasks under time pressure and stress, decision-making in conditions of noise and visual distractions.
Objective: To develop adaptation to cognitive stress, enhance decision-making speed, and improve situational awareness by simulating extreme conditions in a safe environment.

Control group
The control group followed a traditional physical training program (the institution's standard program) for 12 weeks: 4 physical training sessions per week (cardio, strength exercises, general physical preparation) without any VR or special psychological training. The training volume for the control group was adjusted to match the overall study load, but did not include any experimental components.

Results
A total of 180 participants (120 cadets and 60 trainees) were recruited for the study. Of these, 90 were assigned to the experimental group and 90 to the control group. During the course of the study, 6 participants (3.3%) did not complete the research due to various reasons (injury, health deterioration, personal circumstances). Consequently, the final analysis was conducted

based on data from 174 participants. No significant differences were found between the groups in terms of age, height, weight, and initial physical indicators ($p > 0.05$), demonstrating that their baseline conditions were comparable.

Running results (1000 meters), The average running result of the experimental group participants improved from the first 4 minutes 02 seconds ± 0.25 to the final stage 3 minutes 41 seconds ± 0.22 ($p < 0.001$). In the control group, the result improved from 4:05 ± 0.28 to 3:59 ± 0.26 ($p < 0.05$), however, this change was statistically lower than in the experimental group ($p = 0.003$).

The average number of pull-ups in the experimental group increased from 9.8 ± 2.1 to 14.6 ± 2.5 ($p < 0.001$),while in the control group it increased from 9.5 ± 2.0 to 11.2 ± 2.3 ($p < 0.05$). The effect size of the difference (Cohen's $d = 0.82$) indicates a strong positive result.

The experimental group increased from 46 ± 7 to 58 ± 6 repetitions ($p < 0.001$); The control group increased from 45 ± 6 to 50 ± 5 repetitions ($p < 0.05$).

Participants in the experimental group demonstrated an increase from 46.2 ± 5.8 cm to 54.7 ± 5.2 cm ($p < 0.001$). The control group increased from 45.8 ± 5.6 cm to 48.1 ± 5.5 cm ($p = 0.04$). This indicates that innovative exercises effectively enhanced strength and explosive movements.

The maximum oxygen consumption (VO2 proxy) of the experimental group increased by 11.2%, while in the control group it increased by 4.8%. The difference is statistically significant ($p < 0.01$). These results confirm the high effectiveness of training based on individualized workloads and biometric monitoring.

Stress resilience (according to the Resilience scale) In the experimental group, the stress resilience index increased from 62.4 ± 8.5 to 78.1 ± 7.2 ($p < 0.001$), while in the control group, it increased from 63.1 ± 8.7 to 67.2 ± 8.1 ($p = 0.04$). This indicates that VR and psychophysiological exercises strengthened adaptation to stress.

Discussion

The results of this study demonstrated that modern, innovative training approaches are significantly more effective than traditional methods in enhancing the physical fitness of cadets and students and preparing them for extreme situations. Notably, when simulations based on virtual reality (VR), biometric monitoring, and psychophysiological training exercises were applied in combination, it was observed that they ensured a balanced development of both physical and mental preparedness. During the study, the participants in the experimental group showed significant improvements in their running, strength, endurance, and explosive power indicators. This can be attributed primarily to the individualization of training loads based on biometric monitoring. By determining the appropriate load level using individual heart rate (HR) and oxygen consumption (VO2) indicators, instances of excessive fatigue or insufficient load were reduced, ensuring optimal training effectiveness.

Secondly, through VR simulations, cadets had the opportunity to train under psychological pressure closely resembling real extreme conditions. This enhanced their stress resilience, quick thinking, and decision-making abilities. Previous studies (for example, Anderson et al., 2021; Zhao, 2022) have established that VR training technologies improve stress adaptation in

military personnel and athletes, and increase accuracy in high-risk situations. Our results also corroborate these scientific findings.

Psychophysiological exercises (breath control, mindfulness, biofeedback) stabilized the autonomic nervous system activity of the participants and improved heart rate variability (HRV). This enhances the body's ability to recover more quickly in stressful situations. Additionally, significant improvements in reaction time and Stroop test results indicate that the training program developed attention, quick thinking, and situational analysis abilities.

The research results align with previously conducted studies. For example, experimental work carried out in military educational institutions of the Armed Forces of the Republic of Uzbekistan (To'rayev, 2020; Sodiqov, 2021) demonstrated that the high effectiveness of physical training is linked to an individualized approach and the use of modern technologies. Furthermore, foreign sources (Klein et al., 2019; Smith, 2020) have highlighted the advantages of VR simulations in reducing stress and creating a safe learning environment under extreme conditions.

In our study, VR-based training significantly enhanced the psychological preparedness of cadets by allowing them to experience extreme situations in a safe yet realistic manner. Additionally, biometric monitoring proved useful in optimizing training loads - a result that aligns with the principles of modern sports physiology (Bompa & Buzzichelli, 2018).

Conclusion

According to the research results, it has been demonstrated that a modern, comprehensive approach is one of the most effective methods for enhancing the physical fitness levels of cadets and trainees and preparing them for extreme situations. The 12-week innovative training program (including VR simulation, biometric monitoring, and psychophysiological exercises) exhibited the following advantages over the traditional training system:

A significant increase in physical indicators: strength, endurance, speed, and coordination indicators improved by an average of 15-25%.Increased stress resistance and psychological resilience: Through VR and breath control sessions, participants' anxiety levels decreased, and their ability to concentrate and make quick decisions improved. Load control using biometric monitoring ensured the safety and individualized effectiveness of training. Psychological preparation for extreme situations - through modeling real conditions, cadets developed skills in behaving in unexpected situations, maintaining balance, and assessing the situation. Strengthening of psychophysiological recovery mechanisms - HRV, respiratory rhythm, and autonomic nervous system activity stabilized.

Overall, the results of the conducted research clearly demonstrated the significance of modern training technologies in comprehensively developing the physical, mental, and cognitive preparedness of cadets and students. These approaches serve as an important scientific and practical foundation for establishing an effective educational process in the military education system, as well as for thoroughly preparing young specialists for real extreme conditions.

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