

CHALLENGES AND SOLUTIONS FOR ENSURING THE SAFETY OF VDT OPERATORS IN WORKING PROCESS

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Abstract. *This article examines the working conditions and labor processes of VDT (Video Display Terminal) operators. The physical conditions of the operators during the work period, including the strain and load on the musculoskeletal system due to repetitive movements, as well as the analysis of the loads during non-operational hours, were identified using a questionnaire survey method. Recommendations have been provided regarding the organization of recovery measures after active work processes.*

Keywords: *video display terminals, working hours, labor process, questionnaire survey, harmful and hazardous factors, labor protection, methods.*

INTRODUCTION. It is evident that various scholars and experts in different countries have conducted a series of researches on labor protection issues. Scientific investigations have been carried out by experts and researchers both in Uzbekistan and abroad to analyze and enhance working conditions, leading to the development of practical solutions and recommendations. Ergonomic and sanitary-hygienic requirements for workplaces and their equipment have been established and implemented [1, 2].

Organizational and Technical Measures for Ensuring Occupational Safety: In conjunction with organizational and technical measures to ensure occupational safety, it is essential for workplaces to possess natural and artificial lighting, heating, ventilation, air conditioning systems, as well as equipment such as illuminating and heating devices. Additionally, furniture in the workplace, including chairs, desks, and drafting tables, must conform to ergonomic standards [3, 4].

However, during the working hours, the musculoskeletal system of the body's moving parts (joints, muscles, tendons, ligaments) may experience strain and load due to repetitive movements, as well as the use of computer technologies (video displays, communication devices, office equipment, etc.) that emit electromagnetic and radio emissions [4]. Prolonged exposure to them can contribute to the strain of the visual and auditory organs, the deterioration of the voice apparatus, the development of occupational diseases, and even the disruption of management functions (errors, effective reactions, psychosomatic impairments).

RESEARCH METHODS. In the field of labor protection, several methods and approaches are utilized. Practical solutions and tools have been developed based on research findings and recommendations in Uzbekistan and other countries to analyze and improve working conditions. These measures include organizational, technical, and managerial strategies aimed at ensuring the safety of workers [5]. Such strategies encompass technological advancements, the transformation of harmful substances into safe materials, the use of safe equipment, and the enhancement of scientific organization of labor to eliminate hazardous factors [5].

METHODS. Approaches guide the implementation of strategies from both a constructive and technical perspective. Notably, three main and universally used approaches to labor protection are commonly applied: preventive, compensatory, and organizational [6].

Employee Activity: Employee activity is closely related to minimal movement since they monitor and manage work processes through video display terminals. Employees who perform tasks using video display terminals and computer monitors may spend considerable time in a sedentary or stationary position. This position imposes unnatural and uncomfortable postures on the human body, affecting the neck, back, shoulder, and wrist muscles. This can lead to conditions like osteochondrosis, compression of the spinal cord, and thermal compression between the chair and the human body. This can result in impaired blood circulation in the pelvic organs, potentially causing conditions like prostatitis and hemorrhoids [7,8]. Inappropriately chosen workstations can lead to prolonged sitting and discomfort, ultimately contributing to spinal disk herniation in the lumbar region, affecting the nerve roots and potentially leading to radiculitis [9]. The main cause of spinal disk herniation is improper posture during work. The prolonged sitting positions in front of computers and video monitors hinder appropriate body movement and lead to the development of illnesses. Incorrect ergonomic design and workplace layout can lead to excessive static loads on the human musculoskeletal system, contributing to various occupation-related diseases [10].

Experimental Research Results: Experimental research outcomes show that in an individual weighing 70 kg, the load on the third lumbar disk is determined by the following values (1st and 2nd images):

1. When standing still - 1000 N;
2. When sitting - 1400 N;
3. When leaning forward with a slight movement - 1500 N;
4. When leaning forward and pushing the body forward - increases to 1800 N.

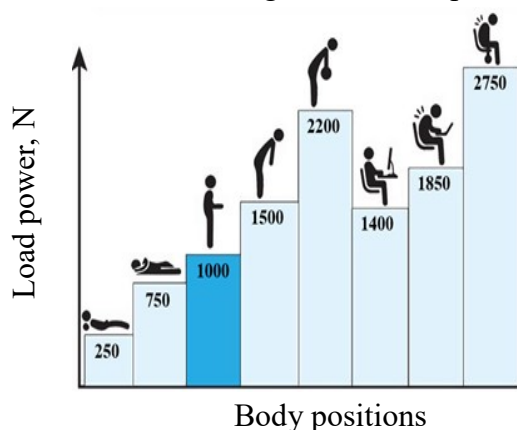
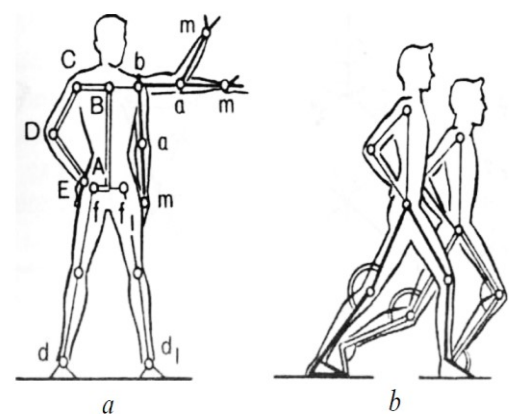


Figure 1. Load strength of the third (L₃) lumbar spine in different positions of the body.



a-chain types; bam — open chain; ABCDEA — closed chain; b — Cross-movement in a closed chain.

Figure 2. Bio-cinematic chains in the human body.

The operation of technical equipment in the production system, with the use of computer technology for extended periods of work, fast pace of work, receiving large amounts of information, performing complex tasks within a limited time frame, often leads to the occurrence of various health issues [7,9], as well as stressful situations, which in turn can result in nervous and psychological strain on the nervous system [6].

RESULTS. The weight of labor in the process of carrying out the work by the operator is manifested in the deformations of the body due to the effects of working conditions, physical and psychological loads on the body.

According to the nature of the work, the weight of the work is characterized by categories. The weight of the work is determined based on the differential between the actual work and the required work.

Supervision methods for operator conditions:

- According to the purpose of supervision;
- According to the method of affecting the operator;
- According to the methods of supervision;
- According to the method of receiving signals.

The choice of the relaxation method and its nature depends on the form of work. Relaxation can be active or passive. Active relaxation involves changing the nature of work or performing work together with relaxation. This method is used in mental activities involving emotional strain and nervous tension. Operators in the human-machine-environment system fall into this category.

Active relaxation types:

Entry-level warm-up exercises - 5-7 minutes.

Physical training breaks. For operators who work in the same posture, breaks of 5-10 minutes are required, 2-3 times during the shift.

Physical training tactics. Designed for complete relaxation of any organ.

Passive relaxation. The body is relieved from the overall load. It only rests. This type of relaxation is essential for individuals engaged in heavy physical labor. Activities such as music, sports, or similar activities are suitable for passive relaxation.

Effective methods are considered to be non-contact. These methods include non-contact supervision: analysis of speech signals, actography, telephone monitoring of operator conditions, and others. Speech signals reflect the emotional and physiological state of the operator. The dynamics of speech, its energy aspects, frequency range, timing, and other factors are the basis for evaluating the operator's condition.

Based on the results of expert evaluation (questionnaire surveys), it was revealed that 25% of workers aged 26-30, 37% of workers aged 31-35, 25% of workers aged 36-40, and 13% of workers aged 51-55 were indicated. The obtained results confirm the severity of working conditions. The number of workers approaching retirement age constitutes 13% (Figure 3).

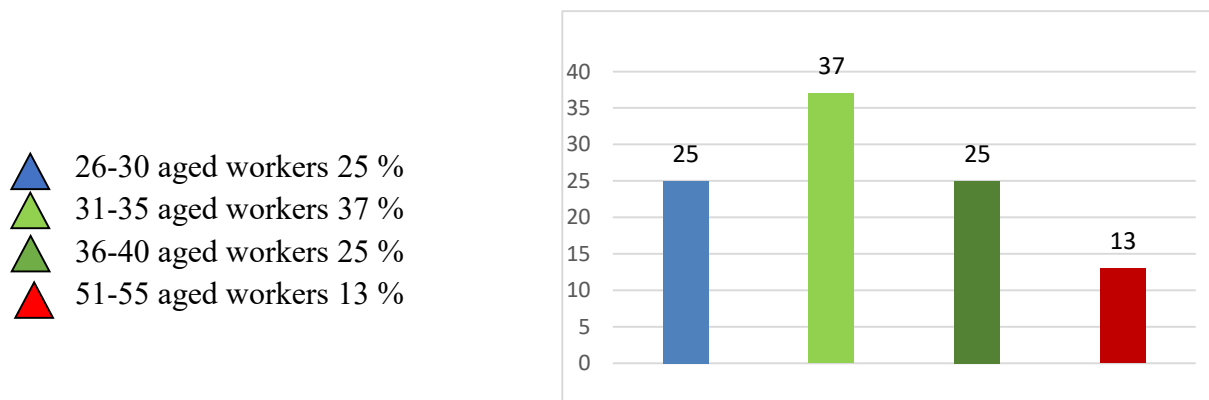


Figure 3. Age composition of workers.

It turned out that noise in the workplace affects 18% of workers, 35% has no negative impact on the exchange of information, 47% has no negative impact, the permissible pressure level of noise in the workplace is in moderation, but in some cases it is necessary to take organizational measures to eliminate situations that can still harm the exchange of information (Figure 4).

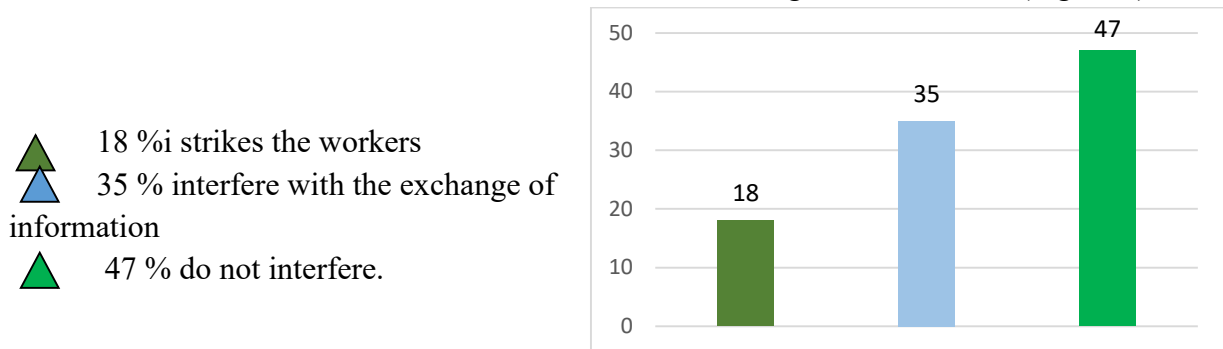


Figure 4. Assessment of noise level in the workplace

65% of jobs were known to experience headaches during working hours and after shifts. Showed that labor activity of workers is at a level higher than the norm of tension (Figure 5).

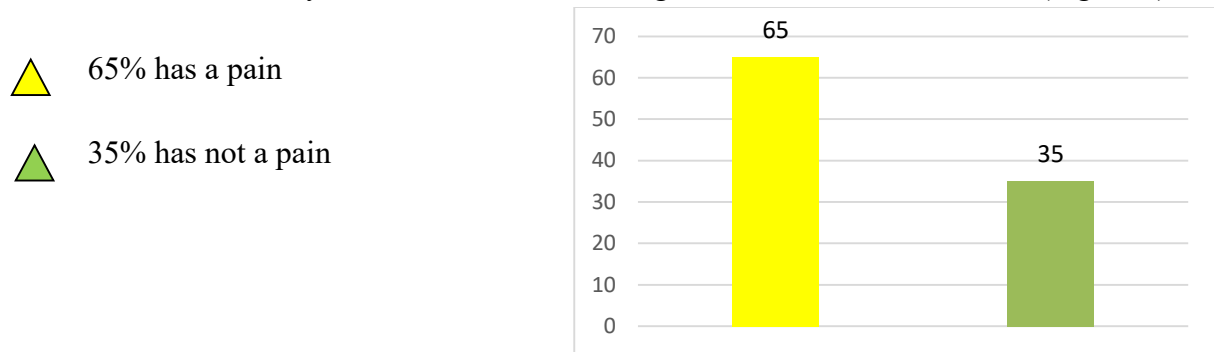


Figure 5. Workers assess the condition of pain in the head.

Scientific research aimed at improving working conditions focuses on the development of ergonomic requirements and protective tools, studying the weight and strain of the work process, directly addressing the improvement of the working conditions of video terminal operators by ensuring the correct arrangement of furniture and equipment in the workplace. The harmful factors of production have been thoroughly studied, as well as ways to reduce them, and innovative technical and sanitary-hygienic solutions have been developed to minimize their impact.

CONCLUSIONS. The use of methods and techniques for ensuring occupational safety in improving working conditions, the deep theoretical and practical analysis of certification results for workplaces, the identification of sources of harmful and hazardous production factors, and the assessment of parameters of weight and strain of labor in accordance with the set goals. Methods (techniques) aim to implement the constructive and technical aspects of working condition improvement. It is known that there are three main and universal methods widely used in the practice of labor protection.

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