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Psychophysiological Hazards in the Workplace and Means of Protection

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Abstract: This article analyses the identification, assessment and mitigation of psychophysiological hazards in the workplace under the conditions specific to Uzbekistan. The problem is not limited to the concepts of "stress" or "fatigue". It is treated as a multi-factor hazard system related to the organisation of the work process, work pace, shift schedule, level of responsibility, physical and neuropsychological strain, the workplace environment and management culture.

The study carries out a comparative analysis of the Labour Code of the Republic of Uzbekistan, the Law on Labour Protection, workplace assessment regulations and sanitary-hygienic requirements, as well as ILO Conventions Nos 155 and 187, GOST 12.0.003-2015, ISO 45001:2018 and the ISO 10075 series. Uzbekistan's ratification of ILO Convention No. 187 in 2021 and ILO Convention No. 155 in 2024 has reinforced the need for systematic management of psychophysiological hazards within the domain of occupational safety.

Keywords: Psychophysiological hazard; occupational safety; neuropsychological strain; working conditions; risk assessment; ISO 45001; ISO 10075; GOST 12.0.003; Uzbekistan.



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Introduction

When thinking about workplace hazards, mechanical injury, electrical current, chemical substances, noise or vibration typically come to mind. This perspective is not incorrect, but it is insufficient. In modern manufacturing, service industries, construction, transport, healthcare, education and digital management systems, an invisible layer of risk is steadily intensifying – one

that directly affects the physiological capacity of the human organism, sustained attention, decision-making speed, emotional resilience and recovery reserves.

In this sense, psychophysiological hazards are becoming not a secondary but a central issue in occupational safety [1]. The ILO views psychosocial hazards as factors in job design, management and organisation that increase the risk of work-related stress [2]. The World Health Organization also notes that mental health risks at work may be linked to job content, work schedules, workplace characteristics and opportunities for professional development [3].

The significance of this issue in Uzbekistan is increasing for two reasons. First, the new Labour Code, which entered into force on 30 April 2023, has placed the matter of safe and healthy working conditions on a clearer legal footing [4]. Second, the country's ratification of ILO Conventions Nos 155 and 187 requires occupational safety to be understood not merely as technical inspection but as preventive, systemic and risk-based management [5], [6].

It must be stated plainly, however: in practice, psychophysiological hazards are frequently lost within the general rubric of "working conditions". Noise is measured, lighting is checked, medical examinations are recorded. Yet factors such as high-attention work, monotonous operations, constant time pressure, shift fatigue, emotional labour, managerial pressure or a lack of meaning at work are in many cases not assessed as independent hazards. The central argument of this article is that Uzbekistan's occupational safety system needs a dedicated methodological block for identifying, assessing and mitigating psychophysiological hazards.

Literature Review and Regulatory Sources

The Labour Code of the Republic of Uzbekistan establishes the general legal foundation for labour relations. It sets out the employer's obligations regarding working conditions, labour discipline, working hours, rest periods and employee rights within a unified system [7]. However, the Code does not elaborate on psychophysiological hazards as a distinct scientific and technical category. This is a natural circumstance, since a code is a legal instrument rather than a methodology. Yet this is precisely where a practical gap emerges: the legal basis exists, but the assessment criteria are not always sufficiently specific.

The Law on Labour Protection defines state policy in the field of occupational safety, as well as the obligations of employers and employees, and addresses improvement of working conditions, prevention and supervision [8]. The Law is broad enough in principle to encompass psychophysiological hazards, since occupational safety covers not only injuries but also factors adversely affecting health during the work process. Its strength lies in its generality; its weakness does too: at the enterprise level, procedures for measuring shift fatigue, cognitive load, monotony and emotional strain still need to be developed separately.

Workplace certification, sanitary-hygienic requirements and sector-specific rules may serve as a practical basis for assessing psychophysiological hazards. For example, certain occupational safety rules in Uzbekistan specify that noise and vibration levels at workplaces must conform to sanitary norms and GOST requirements [9]. A crucial point applies here: noise and vibration are typically measured as physical factors, but their effects on attention, neurological strain and fatigue produce psychophysiological outcomes. Measuring the physical factor is therefore only the first step towards understanding the psychophysiological hazard.

In the Russian and CIS tradition, psychophysiological hazards are classified primarily through occupational physiology, ergonomics and GOSTs. GOST 12.0.003-2015 classifies hazardous and harmful occupational factors and divides work-process factors by origin into psychophysiological, organisational-managerial, personal-behavioural and socio-economic groups [10].

The strength of this standard is that it incorporates the psychophysiological factor into occupational safety terminology. Its limitation is that it names the hazard without providing a ready-made assessment scale for each enterprise. It is therefore more appropriate to adapt it to Uzbekistan's conditions across specific workplaces, occupations and sectors, rather than copying it directly.

GOST 12.0.003-74 divided psychophysiological hazards into physical overload and neuropsychological overload [11]. This classification is simple but retains practical value. However, in today's digital work environment, reducing "neuropsychological load" solely to operator or dispatcher work is no longer sufficient. Electronic monitoring, constant online communication, multi-tasking, rapid reporting and KPI pressure have themselves become psychophysiological hazards.

ISO 45001:2018 establishes international requirements for occupational health and safety management systems. It is based on hazard identification, risk assessment, management responsibility, worker participation and continual improvement. Although this standard does not assess psychophysiological hazards in depth, it provides a convenient framework for incorporating them into a management system.

ISO 10075-1:2017 defines terms and general concepts in the field of mental workload, treating mental stress, mental strain and their short- and long-term consequences as interrelated concepts. ISO 10075-2:2024 provides guidance for accounting for the effects of mental workload in the design of work systems, tasks, equipment, workplaces and organisational-social factors.

The 2022 joint policy of WHO and the ILO frames mental health at work through a triad of "prevention, protection and support". This approach is significant for Uzbekistan, because redesigning the work process to prevent fatigue from occurring in the first place is considerably more effective than treating the employee's condition as a medical problem after burnout has set in.

Research Methodology

The following methods were employed in this article:

Regulatory-legal analysis. Uzbekistan's current labour legislation, occupational safety documents and ratified ILO conventions were examined.

Comparative analysis. The approaches of Uzbekistan, Russia/CIS and international standards were compared.

Risk matrix method. Psychophysiological hazards were assessed according to probability, severity of consequences, duration of exposure and adequacy of controls.

Integral index method. A system of indicators was proposed to synthesise the psychophysiological hazard level at the workplace.

Graphical and diagrammatic analysis. The relationships between hazard sources, impact mechanisms and preventive measures were visualised.

Results

Classification of Psychophysiological Hazards

Table 1. Proposed classification of psychophysiological hazards in the workplace.

No.	Hazard Category	Examples	Primary Impact Mechanism	Probable Consequences
1	Physical overload	Heavy lifting, awkward posture, prolonged standing	Strain on musculoskeletal and cardiovascular systems	Rapid fatigue, reduced work capacity
2	Cognitive load	Dispatching, engineering calculations, operator tasks	Depletion of attention, memory and decision-making resources	Errors, delays, reduced quality of output
3	Emotional load	Client conflict,	Necessity for emotional	Professional burnout,

		medical services, education	self-regulation	irritability
4	Monotony	Assembly line, repetitive operations	Diminished attention, sensory saturation	Drowsiness, automatic errors
5	Time pressure	Tight deadlines, emergency work	Stress response, rapid decision-making	Risky decisions, fatigue
6	Shift work	Night shifts, extended duty	Disruption of circadian rhythm	Degraded sleep quality, incomplete recovery
7	Organisational ambiguity	Unclear task definition, undefined responsibility boundaries	Role conflict	Conflict, job dissatisfaction
8	Socio-psychological pressure	Managerial pressure, discrimination, bullying	Loss of psychological safety	Stress, intent to leave employment

Table 1 proposes viewing psychophysiological hazards not merely as medical symptoms but as structural deficiencies in the work process. This approach is consistent with the perspectives of ISO 10075 and the ILO on psychosocial hazards [9], [11].

Psychophysiological Risk Assessment

Assessing a psychophysiological hazard by a simple "present/absent" method is inadequate. The following integral risk formula is therefore proposed.

Psychophysiological risk level:

$$R = P \times S \times E \times K \quad (1)$$

Where:

R – psychophysiological risk level;

P – probability of hazard occurrence, on a scale of 1 to 5;

S – severity of consequences, on a scale of 1 to 5;

E – duration of exposure, on a scale of 1 to 5;

K – coefficient indicating inadequacy of control measures, ranging from 0.5 to 1.5.

In Formula (1), the risk is linked not only to the existence of a hazard but to how frequently, how severely and how long it exerts its effect. Where shift schedules, rest arrangements, job rotation, psychological support and managerial oversight are well organised, K may fall within the range 0.5–0.8. Where controls are merely formal, it may rise to 1.2–1.5.

Risk level interpretation

Table 2. Psychophysiological risk assessment scale.

R value	Risk Level	Interpretation	Management Decision
1–15	Low	Hazard present, but controls are adequate	Scheduled monitoring

16–40	Medium	Probability of fatigue and errors exists	Review work schedule and task allocation
41–75	High	Significant probability of adverse effects on health and safety	Immediate preventive measures
76+	Critical	Continuing work may be hazardous	Suspend or reorganise the work

Table 2 is intended to enable rapid decision-making at enterprise level. However, this scale is not a universal truth. It must be calibrated according to the sector, occupation and characteristics of the work. In dispatching, for instance, the consequences of a cognitive error may be severe; in office work, the primary impact is typically on quality and deadlines.

Integral Workload Index

Formula for the integral workload index:

$$IWL = (T_{phys} + T_{cog} + T_{emot} + T_{mono}) / T_{total} \quad (2)$$

Where:

IWL – integral workload index;

T_{phys} – time spent in physical strain;

T_{cog} – time spent in cognitively demanding work requiring high attention;

T_{emot} – time spent in emotional strain;

T_{mono} – time spent in monotonous work;

T_{total} – total working time.

If IWL exceeds 0.7, there is an increased probability that the employee is spending the greater part of the working day in a state of limited recovery capacity. This formula does not constitute a medical diagnosis; it provides a signal to reorganise the work.

Recovery Adequacy Coefficient

Formula for the recovery adequacy coefficient:

$$K_{rec} = (T_{rest} + T_{rotation} + T_{sleep}) / T_{strain} \quad (3)$$

Where:

K_{rec} – recovery coefficient;

T_{rest} – time allocated to rest and breaks;

$T_{rotation}$ – time spent in job rotation or transfer to lighter duties;

T_{sleep} – time allocated to sleep and post-work recovery;

T_{strain} – time spent in strain-inducing work.

If $K_{rec} < 1$, recovery is not compensating for the strain incurred. This is particularly critical in night-shift work, extended duty, work in hot climatic conditions on construction sites, or high-responsibility operator tasks.

Analysis and Discussion

There are several latent problems in the assessment of psychophysiological hazards in Uzbekistan. The first is that occupational safety practice is often evaluated on the basis of documentation compliance. Documentation is, of course, necessary. However, questions such as whether employees are genuinely fatigued, whether their attention is declining by the end of a shift, and whether managerial pressure is leading to unsafe behaviour are asked far less frequently [12], [13].

The second issue is that a "resilience culture" prevails in certain sectors — that is, employee fatigue is interpreted as professional dedication. This may appear convenient for the employer in the short term, but in the longer term it inflicts economic damage through errors, injuries, staff turnover and professional burnout [14].

Third, psychophysiological hazards are multi-sector in nature. In construction, for example, heavy physical labour, working at height, hot climate, time pressure and subcontracting arrangements intertwine. In education, emotional labour, documentation burden and social expectations may dominate. A single questionnaire is therefore insufficient to comprehensively assess all occupations.

Comparison of Regulatory Approaches

Table 3. Comparative analysis of approaches: Uzbekistan, GOST and ISO/ILO.

Criterion	Uzbekistan practice	GOST 12.0.003 approach	ISO/ILO approach	Authors' assessment
Primary focus	Occupational safety, working conditions, sanitary requirements	Classification of hazardous and harmful factors	Risk-based management and prevention	Legal basis exists in Uzbekistan; methodology needs strengthening
Status of psychophysiological hazard	Not separate; subsumed within general working conditions	Recognised as a distinct hazard category	Mental workload and psychosocial hazards addressed systematically	GOST provides the taxonomy; ISO/ILO provides the management logic
Assessment instrument	Certification, sanitary-hygienic inspection	Classification	Risk management, work system design	An integral model is required
Worker participation	Provided for in legislation	Limited	A key element in ISO 45001	Employee surveys and anonymous reporting systems are needed
Prevention	Primarily technical and organisational measures	Hazard identification	Work redesign, management responsibility	Prevention has not yet fully reached the level of 'job design'

Table 3 demonstrates that the most appropriate path for Uzbekistan is not to copy a single source. National legislation provides the legal foundation, GOST provides the classification language, while ISO 45001 and ISO 10075 offer mechanisms for management and ergonomic design [15].

A five-block model is proposed for managing psychophysiological hazards under the conditions of Uzbekistan.

Table 4. Integral management model for enterprises in Uzbekistan.

Block	Content	Practical instruments	Responsible party
1	Legal compliance	Labour Code; Law on Labour Protection; ILO Conventions	Employer, legal counsel, occupational safety service
2	Hazard identification	Questionnaires; observation; work process mapping	Safety engineer, HR department, line manager
3	Quantitative assessment	Calculation of R, IWL, K_rec (Formulae 1–3)	Occupational safety service
4	Prevention	Work redesign; job rotation; breaks; improvement of the work environment	Employer and management
5	Monitoring	Repeat surveys; error and incident analysis; sick-leave dynamics	Trade union, occupational safety service

The joint representation of the HR department and the occupational safety service in Table 4 is not coincidental. Psychophysiological hazards arise at the intersection of occupational safety, human resources, sanitary-hygienic practice and management culture. Effective protection against them through a single department alone is difficult to achieve.

Conclusion

Psychophysiological hazards are a matter that requires dedicated methodological attention within Uzbekistan's occupational safety system. The current legislation creates a legal basis for safe and healthy working conditions. The ratification of ILO Conventions Nos 155 and 187 strengthens that foundation with international commitments. However, the legal basis alone is not sufficient. What is needed at enterprise level is a practical mechanism capable of measuring, analysing and compelling the reorganisation of work in response to identified hazards.

The formulae R, IWL and K_rec proposed in this article do not fully resolve the problem – they are diagnostic tools. However, through these tools an employer moves from the general statement that "employees are fatigued" to the specific question: "at which workplace, which factor, at what level is the hazard arising?" This transition is, in the authors' view, the most important step for practice in Uzbekistan.

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