

IMPROVEMENT OF LABOUR PROTECTION SPECIALISTS COMPETENCE ASSESSMENT OF COGNITIVE ERGONOMIC ASPECTS IN JSC LATVIAN STATE FORESTS (LVM) NURSERIES

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Abstract. Influenced by the current covid-19 situation in Latvia and in the world, work environment is associated with psychological load - the psycho-emotional risk factor as an aspect of cognitive ergonomics, which can affect employees' health, productivity and quality. Forest nursery work is usually solitary, and it is conducted out-of-doors. In Latvia the agricultural industry employs about 50 thousand workers in various trades performing diverse tasks, for example, working at forestry tasks with tractor equipment and in outdoor conditions with hand-held power tools, as well as office work and working with timber transport. The aim of the study is to improve the competence of labour protection specialists in the context of cognitive ergonomics risk assessment in order to reduce the impact of psycho-emotional risks on the health of forest management workers. The following methods were used in the research: work environment risk assessment, burnout syndrome test, and the method for determining the working capacity index, Charles D. Spielberger's survey, and a well-being survey. The highest risk factors for forestry workers in their daily employment are working in a forced position and in different weather conditions, which can affect employees psychologically. The largest number of employees with signs of fatigue is found in the age groups of 40-49 and 50-59 years. The study identified the need to increase the competence of labour protection specialists by improving the master program to ensure the necessary raising of awareness in the context of cognitive ergonomics.

Keywords: cognitive ergonomics, engineering education, forestry workers, psycho-emotional risk factors.

Introduction

As Latvia's forests occupy approximately 3.4 million hectares, or 53% of the entire country's territory, Latvian forestry can be described as sustainable. This area continues to increase every year, both naturally and by afforestation of land that cannot be used for agriculture. Latvian State Forestry manages 1.62 million hectares of state-owned land, including 1.59 million hectares of forest land, of which 1.39 million hectares are forested [1].

According to information in "Forest Sector in the 25 Years of Latvia's Independence" [2], the wood processing industry has developed into one of the most important sectors of the national economy by generating 20% of the national export income, and this sector employs more than 80 thousand people. Latvian forests have great natural value, unique in some cases not only at the European level, but also at the global level. Quality improvements and safety are the main requirements of cognitive ergonomics, as workplace modernization and mechanization make more demands on the decision-making and monitoring capabilities of service workers, which increases the potential risk for errors and accidents. The study [3] indicates that the main research direction of workplace cognitive ergonomics is cognitive tension caused by cognitively stressful conditions that worsen people's well-being and their performance of work processes. The researchers emphasize that a successful assessment of the risks of the work environment requires actions on both the individual and organizational level. Its practical aim is to explain human capabilities and limitations in information processing, to improve working conditions and employee performance as well as safety and health, and to prevent employee errors and unnecessary stress and strain [4].

The skills of those employed in forestry are related to educational requirements, which differ greatly among employees. Forestry workers who are less educated are more likely to perform physical tasks, while those who are more educated do clerical work and focus on analysis. Almost all forestry workers must have critical thinking and problem solving skills. Employees need knowledge of natural resources, including biology and geography and related sciences; and communication skills to write reports or collaborate with colleagues. The required qualities and skills may vary depending on the profession. For example, loggers need physical stamina to cross forest areas with equipment, while forest management professionals need management skills as they coordinate forest management activities [5].

To work in these professions, forestry workers usually need a secondary school diploma, and to work as a forest management specialist a bachelor's degree is the minimum requirement. Forestry

workers are usually trained on the job, often with the assistance of experienced workers, and training lasts between 1 and 12 months. Depending on the country in which they are employed, these employees may also be required to complete various professional development programs [6].

In the work environment, in the context of cognitive ergonomics, the study [7] indicates health problems caused by psychosocial work risk factors: mental disorders (depression) and cardiovascular diseases. It has been proven that stress at the workplace has a more negative effect on the immunity of older workers [8], while shift work and work stress affect metabolic syndrome [9]. These risk factors and work-related stress are considered the most complex occupational safety and health issues, given that they affect individuals, organizations and the economy [10] (especially Covid-19, as it creates fear of contact with infection and its subsequent transmission to others, particularly their families), increased workload, lack of recognition by society and the organization, and a sense of powerlessness [11]. The study [12] analysed gender differences in relation to the effects of psychosocial and ergonomic factors at work and work-related health. It concluded that reducing the exposure of working women to work stress can be achieved by reducing monotonous work and improving working conditions. High workload is the main risk factor contributing to the development of diseases of the musculoskeletal system [13]. The load caused by different work positions and on stressed body parts can have a devastating effect on the musculoskeletal system [14; 15].

In order to find out the risks of the cognitive ergonomics work environment and reduce their impact on the health of the employees, the senior labour protection specialist is co-responsible. This individual needs the competence to be able to use the appropriate knowledge and skills in any sector of the economy.

Materials and methods

In order to find out whether future labour protection specialists are able to independently formulate and critically analyse and forecast the problems of developing a safe, health-friendly and sustainable work organization and management system and to evaluate the impact of psycho-emotional factors on the health of employees, a study was conducted among Latvian State Forestry tree nursery employees during the professional practice "Labour protection in the national economy II". They numbered approximately 300 employees, and 104 employees were interviewed. Surveys and observation were conducted in the work environment. The assessment and characterization were carried out with confidentiality in mind.

After listening to Latvian State Forestry desire to study two forestry positions which are exposed to several risks in their daily work, descriptions of these positions were collected in order to understand and evaluate the main duties of these positions. It is necessary to understand whether the employees have any additional duties that need to be performed beyond the specified job description.

Various types of tests and surveys were conducted for the employees of Latvian State Forestry tree nurseries. The study surveyed 104 workers. Despite the heavy physical work that employees in this position need to do, the majority of employees are women.

With the help of Spielberger's survey, it was possible to determine how the employee feels about different stressful work-related situations. The survey consists of two parts, where for each situation that the employee finds more stressful and which occurs frequently, it is necessary to mark "X" next to Yes, and if it does not happen, then mark "X" next to No [16].

The method of determining the working capacity index is based on the question and answer method, and as a result of collecting the points, the working capacity situation of the employees can be assessed and the occurrence of occupational diseases can be avoided. Seven components are used for risk assessment (I – poor work ability, 7-27 points; II – average work ability, 28-36 points; III – good work ability, 37-43 points; IV – very good work ability, 44-49 points. Each assessment interval is divided into 4 categories and has a certain number of points ranging from 7 to 49 [17].

With the help of the burnout syndrome test, using the offered scale of points (21 in total), it is possible to assess the state of feelings and fatigue of the employee while performing direct work duties. Each respondent can confirm the existence of these feelings with 7 answers, each answer corresponds to a certain number [17].

A questionnaire was created to measure self-assessed well-being, to determine whether the state of health and well-being cause concern about long-term adverse effects of stress and the possible development of psychosomatic diseases. On the survey the employee had to note if the specified symptoms had been experienced during the last 6 months. If the employee answered affirmatively to three or more questions in one of the categories, it is likely that the person had been exposed to short-term stress and the balance of stress hormones had been disturbed. In such situations, it is recommended that the work and the duties to be performed in it are evaluated, in order to identify the reasons for possible overload and reduce them, as well as to think about the possibilities of improving working capacity. If there is a situation where five symptoms are noted in one of the categories, then in such a situation it is definitely recommended to seek the help of an appropriate specialist (for example, a psychologist).

An expert interview based on several publications was used to assess the competence of labour protection specialists [18]. The authors of this study selected experts who have competence in the field of labour protection and the commensurate education to conduct expert evaluation. Three experts participated in the implementation of the labour protection study programs.

Experts whose field of activity is the higher education system were selected with regard to the objectives of researchers. The scientific status of the experts (Dr.sc.) and their experience can be seen in Table 1.

Table 1

List of experts

Experts	Experience		Scientific and academic degree
	Position	Length of service, years	
A	Associate professor, Leading researcher	22	Dr. silv.
B	Associate professor, Leading researcher	15	Dr.sc.ing.
C	Associate professor (Emeritus)	52	Dr.sc.ing.
D	Professor (Emeritus)	47	Dr.sc.ing.
E	Associate professor, Leading researcher	18	Dr.sc.ing.

Results and discussion

Based on the authors' observations and discussions with occupational safety specialists, it was established that psycho-emotional risk factors in the work environment are not always assessed, as provided for by the Ministry Cabinet Regulation No 660 [19].

Summarized in Table 2 are the characteristics of the respondents who participated in the assessment of cognitive ergonomic risk factors for employees of Latvian State Forestry tree nurseries.

Table 2

Characteristics of respondents

Indicators		Number of respondents	Gender	
			Female	Male
Age, years	20-29	16	14	2
	30-39	21	18	3
	40-49	35	31	4
	50-59	26	19	7
	60-69	4	3	1
	70-79	2	-	2
Total		104	85	19

In spite of the physical load that is demanded of employees in this occupation, the majority of them are women. Forestry workers are most widely represented by the age group of 40-49 years, followed by 50-59 years.

Figure 1 shows the results of the research on how the employee feels in various work-related situations using the Spielberger's method.

Analysing the obtained results, it was found that the greatest stress and discomfort is caused by a noisy work environment, as indicated by 26% of respondents. Measurements carried out in an accredited laboratory indicate that the greatest noise in the working environment is caused by tractor motion when the noise reaches 94.4 ± 3.3 dB while driving with an open window. On the other hand, when moving with the window closed, the noise level reaches 79.5 ± 3.3 dB. Headphones are mandatory when moving a tractor. On a daily basis, there is also work with a container washing machine, with an average noise level of 81.7 ± 3.3 dB over an 8-hour period, while the maximum noise level of the machine reaches 120 ± 3.3 dB. A lift is used to move pallets, the noise level of which is 82.8 ± 3.3 dB over 8 hours.

Dissatisfaction among employees is also caused by a lack of recognition from management for a job well done, which was indicated by 20% of respondents.



Fig. 1. Results of the respondents' survey by using Spielberger's method

The psycho-emotional state of the employee is greatly impacted while doing greenhouse work and work in outdoor conditions when the temperature is very high. Heatstroke becomes a very real threat. The temperature can reach up to 40 degrees in greenhouses in summer. The results of the burnout syndrome test indicate that 88%, the majority of employees, do not experience fatigue. 12% of employees who belong to the age groups of 40-49 and 50-59 feel exhaustion and fatigue. Fatigue is possibly caused by the fact that daily work is physically demanding, and in such situations regular rest breaks would be desirable in order to avoid health problems. Also, visits to a psychologist would be recommended in order to successfully identify the problem.

The results of the self-test indicate that only 17% of employees have been impacted by short-term exposure to stress and the imbalance of stress hormones. The results of the work ability index test (Table 3) indicate that the employees of Latvian State Forestry tree nurseries are optimistic about their own forecasts to continue working at least 2 years into the future, and most of them are confident that they will be able to perform their work duties.

Table 3

Performance index test results

Components	Result (n = 104)	Average score	Correspondence of results to the answer variant
Current working abilities compared to the best	761	7.32	6 = good 8 = very good
Capacities referring to physical workload	363	3.50	3 = medium 4 = good
Capacities referring to mental work abilities	416	4.00	4 = good
Number of diagnosed diseases within 5 years	478	4.60	4 = 2 diseases 5 = 1 disease
Personal assessment of work incapacity due to illness	510	4.90	4 = incapacity is rare (3-6 times per year) 5 = failures are very rare (2-3 times a year)
Absence from work due to illness during the last two years	449	4.32	4 = 1-9 days 5 = 0 days
Employee's personal forecast for work capacity at least 2 years ahead	642	6.20	4 = I am not sure I will be able to work 7 = absolutely sure I will be able to work
Workload planning matching individual abilities	351	3.40	3 = medium 4 = very good
Work team psycho-emotional assessment	330	3.20	3 = medium 4 = very good
Average	41.36 = 41		

When calculating the working ability index, an average value of 41 points was obtained, which corresponds to category III, or good working ability.

Studies [20; 21] indicate that psychosocial risks and work-related stress are measured in several ways. One way is self-administered questionnaires, which usually contain questions about the presence of risk factors. These are widely used in the work environment because they are cheap and easy to analyse. The disadvantage of such questionnaires is that they show only a subjective opinion, which reflects the employee's individual perception of work stress. On the other hand, an objective assessment is based on the observation method, which also includes analysis of historical data on sick leave, performance indicators and accidents at work. Measurements of heart rate, blood pressure, blood sugar, uric acid, cholesterol are also considered reliable ways to measure stress levels.

In order to find out whether an objective assessment of the risks of the cognitive ergonomics work environment was carried out for the employees of the Latvian State Forestry tree nursery, an expert interview was conducted. Key takeaways:

Expert A. When answering survey questions, employees do not present sufficient understanding of the presence of cognitive risks. It is necessary for the employees to carry out additional training to improve competence in order to feel confident about work performance, averting stress. Improve communication between the employer, the employee and the labour protection specialist.

Expert B. For employees, the attitude towards surveys and compliance with work safety rules is often formal. The evaluation is done very superficially; it does not reflect the real situation. Employees often have to perform additional work that is not mentioned in their job description, which can cause overload. Labour protection specialists should work with a psychologist, an ergonomist, to carry out thematic training that will reduce the careless attitude of employees towards their health, haste, stress, and unexpected events that cause injuries at the workplace.

Expert C. In order to assess the cognitive risks of the work environment, it is necessary to carry out observations and mandatory health examinations, because when conducting surveys, the employee's

individual perception of work stress cannot be assessed. Often, employees themselves do not want to observe work and rest times, which leads to overload and emotional burnout. It is necessary for labour protection specialists to conduct thematic training, which would be able to point out to employees the health problems that arise as a result of non-compliance with the rules.

Expert D. The flaw in surveys is respondents' ability to hide true information, to candidly answer only partially. This, in turn, does not give a true assessment of cognitive risk factors. Many companies do not have an occupational safety specialist. They engage a competent outside specialist for risk assessment, for whom it is more difficult to assess the mental demands, the amount of workload and the ambiguity of work. Labour protection specialists should pay more attention to employees aged 40 and over, because when engaged in physically hard work without rest breaks, overload and fatigue occur.

Expert E. Occupational safety specialists need to improve their competence in assessing risk factors of cognitive ergonomics, because it is essential to assess negative stress factors in the work environment. Increasingly, the quality of work life decreases under the influence of psycho-emotional risks, and the health of employees deteriorates.

Based on the findings, the authors of the study can conclude that the active involvement of labour protection specialists, employees, and employers in the development of competence contributes to more effective changes in attitudes, knowledge, skills and understanding.

Conclusions

1. The highest risk factors for forestry workers in their daily employment are working in a forced, static position and in different weather conditions, which can affect employees psychologically. The largest number of employees with signs of fatigue is found in the age groups of 40-49 and 50-59 years.
2. According to Spielberger's survey, for 25% of employees additional dissatisfaction is caused by a noisy work environment, by insufficient recognition and praise from management. The performance of new and unknown duties was noted by 19% of employees.
3. The study identified the need to increase the competence of labour protection specialists by improving the master program to ensure the necessary raising of awareness in the context of cognitive ergonomics.

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