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Assessment of Ergonomic Risks in Manufacturing Enterprises in the Czech Republic

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Abstract
The paper maps the evaluation of ergonomic risks in Czech processing industry enterprises. In today's dynamic times, the main challenge is to retain quality employees and focus on them. Safety and health protection at work and monitoring and evaluation of ergonomic risks at the workplace are related to employee care. The paper summarizes the results of a nationwide questionnaire survey of the manufacturing industry in the Czech Republic. The obtained data was evaluated by using basic descriptive statistics. Nonparametric statistical analysis (Fisher's exact test) confirmed or excluded hypotheses. The performed analysis shows that the use of ergonomic risk methods does not statistically depend on the type and size of the enterprises. It is further evident from the research results that Czech enterprises should monitor ergonomic risks more.

Keywords
ergonomic, fisher's exact test, human factor, industry 4.0, lean management, manufacturing industry.

Introduction

The current era is focused on performance, profit maximization, and cost minimization. As the pressures on these factors increase, so do demands on employees, increasing the risks to their health. Risks in the work environment include physical, chemical, biological, ergonomic, and psychosocial aspects. Each of these factors can have a different impact on workers' health and safety. Risk factors not only pose an immediate threat to workers' health but can also have a long-term impact on their overall productivity and quality of life. Investigating risk factors in the work environment supports the development of strategies and solutions to ensure a safer and healthier work environment (Zocova, 2023).

Although it is general knowledge that the care of the employee should come first, this is only sometimes the case. Employees are the most critical link for an organization's efficient functioning; therefore, paying attention to their health and safety is essential.

The paper aims to map the situation in manufacturing industry enterprises. The author team assumes that enterprises should monitor and evaluate ergonomic risks more. Enterprises implementing lean management methods focus more on ergonomic risks. The subject of the study by Brito et al. (2019) was to investigate how the methods and principles of lean production, together with the aspects of safety and ergonomics, contribute to higher efficiency, productivity, and well-being of workers. Lean Manufacturing (LM), Ergonomics and Human Factors (E&HF), and Human–Robot Collaboration (HRC) are resonant topics for researchers and enterprises (Colim et al., 2021; Jazani et al., 2018).

Over the past two decades, lean manufacturing and ergonomics themes have garnered significant attention as areas of study and integration to enhance manufacturing processes. An increasing number of enterprises recognize the potential impact of combining ergonomics with lean manufacturing implementation on improving workers' productivity and reducing work-related risks. However, there is a scarcity in reviewing whether lean improves productivity without endangering ergonomics (Al-Zuheri et al., 2023).

Literature review

Part 1: Ergonomic

The term ergonomics (in its current meaning) was coined by psychologist Murrell, who founded the first national ergonomics society to protect workers' health,

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safety, and welfare (Koningsveld, 2019; Karwowski, 2006). Ergonomics is a critical factor in improving workplace health and productivity (Bortolini et al., 2023). Ergonomics aims to create a work environment that combines safety and productivity to prevent health, physical, and psychological harm (Naeini & Mosaddad, 2013; Dalle Mura and Dini, 2019; Bridger, 2006).

The discipline of ergonomics supports a holistic, human-centered way of designing work processes. This approach considers physical, cognitive, social, organizational, and other relevant factors independent of the time, space of human activity, and the specific technology used (Salvendy & Karwowski, 2021; Burov, 2020; Karwowski, 2012). Creating healthy workplaces with ergonomic risks in mind is becoming essential to a preventative approach to workplace design. A preventive approach, including economic, health, and safety measures, positively impacts workers' health (Onofrejova et al., 2022).

Ergonomics is generally used to improve the quality of human life, such as health, safety, comfort, and productivity. Ergonomics can be analyzed in two dimensions. The first is the organizational dimension (also called organizational ergonomics or macroeconomics), which refers to optimizing socio-technical systems, including their structures, policies, and processes. The second is the physical dimension (physical ergonomics), which is more related to the organization's sustainability (Ramos-García et al., 2022). According to the International Ergonomics Association (IEA), it is possible to divide ergonomics into physical, cognitive, and organizational. (Teixeira et al. (2022) state that ergonomics examines body posture at work, handling tools, movements performed at work, repetitive movements at work; mental overload, decision-making, and computer interaction; group projects, cooperative work and remote work and quality control (Teixeira et al., 2022). Workers' health, safety, and well-being are a fundamental concern for working people worldwide. Caring for this area significantly impacts the productivity, competitiveness, and sustainability of businesses, communities, and national and regional economies (Bevan, 2015).

Today, almost all countries are aware of providing employees with a safe and healthy work environment. Most workers in developing countries are employed in factories and enterprises without health and safety requirements or records of occupational accidents or diseases. Also, no injury or illness prevention programs are implemented. The challenge for employers and politicians is eliminating diseases, economic costs, and long-term loss of human resources from unhealthy workplaces (Onofrejova et al., 2022; WHO, 2010).

Fabrizio Russo examines work-related musculoskeletal disorders, which currently represent a stimulating and complex health challenge for occupational medicine. The study states that many workers experience one or more musculoskeletal disorders while performing their work (Russo et al., 2020). Work-related musculoskeletal disorders are such a severe health problem that they can lead to permanent disability and cause an economic burden of up to 2% of the Great Domestic Product (GDP) (Cerqueira et al., 2020).

Part 2: Ergonomic risks

Frequent execution of repetitive movements and handling heavy components are among the main factors that characterize the assembly process and can lead to worker overload (Dalle Mura & Dini, 2019). Without automated means, workers may suffer physical and psychological harm due to ergonomic risks associated with the activities performed (Teixeira et al., 2022). The combination of excessive workload, non-ergonomic positions, and repetitive movements is the basis of work-related musculoskeletal disorders (Van der Have et al., 2023). Poor posture can also lead to musculoskeletal disorders, which majorly impact a worker's life and the economy (Van Crombrugge et al., 2022). The most common peripheral nerve involvement syndrome with a high prevalence among workers is carpal tunnel syndrome (Hassan et al., 2022).

It is essential to identify and assess ergonomic risks at the workplace. According to the study by (David (2005), the methods for measuring ergonomic risks can be divided into the following:

- Self-assessment (collecting data from the worker through interviews or questionnaires) – direct, cheap, but usually inaccurate and subjective
- Based on observation (at the workplace by observation or video recordings). This type of observation – can be divided into:
  a) Easier, represented by worksheets – RULA (Rapid Upper Limb Assessment), REBA (Rapid Entire Body Assessment), NIOSH (National Institute for Occupational Safety and Health), which are affordable. However, their results are highly dependent on professional knowledge.
  b) Advanced (use of software) – significantly higher costs, more time consuming, more expertise, more accurate results
- Instrumental methods (motion sensing, use of depth cameras) – provide accurate data and objective measurements in real-time. A popular device is the Inertial Measurement Unit (IMU), which makes it possible to capture 3D motion (David, 2005).

A newly developed self-regulation technique, called Biofeedback, solves the problem of not being aware of incorrect posture. This technique warns a person through signals about bad posture (Cerqueira et al., 2020).

Part 3: Assessment of ergonomic risks

The three most used ergonomic assessment methods are RULA, REBA, and OWAS (Van Crombrugge et al., 2022).

RULA focuses on the assessment of the upper limbs, neck, and trunk of the body (Kumar et al., 2019). It is a quick assessment tool that assigns points from 1 (lowest risk) to 7 (highest risk) to the analyzed task. The method compares the body's angles with pre-defined ones (Generosi et al., 2022). Thanks to the RULA scoring system, it is possible to get an immediate overview of the most significant risks of a given work position during work tasks (Das et al., 2023).

REBA assesses the ergonomic risk factor for uncomfortable, static, permanent work positions (Abu-Kasim and Mohd-Taib, 2022). It is a simple method that does not require high knowledge or expensive equipment and assesses the biomechanical and postural loading of the body using a systematic process (Nelfiyanti et al., 2022; Das et al., 2023). Each position is assigned a score that is calculated based on an analysis of the position checklist: neck, upper limb, trunk, lower limb, and wrist position (Generosi et al., 2022). REBA classifies the joint movements of the whole body into specific groups, while RULA focuses on the classification of the upper body, including the trunk (Abu-Kasim and Mohd-Taib, 2022).

OWAS (Ovako Working Analysis System) is a job evaluation method. This method is widely used for its simplicity and broad applicability. OWAS is less practical if more detailed results are needed due to simplified working positions and more unspecified results (Jeong et al., 2023).

Other methods for assessing ergonomic risks include the Job Strain Index. The Job Strain Index is considered to be the most appropriate semi-quantitative method for measuring musculoskeletal disease risk factors for the upper body, including elbows, forearms, wrists, and hands (Restuputri et al., 2020; Widodo et al., 2020). It is an observational method to determine risk factors in repeated tasks (Mohammadpour et al., 2018).

KIM (key indicators method) assesses the risk of manual handling of burdens at the screening level (Steinberg, 2012). There are three types of worksheets – one for lifting, holding, and carrying loads (KIM-LHC), one for pulling and pushing loads (KIM-PP), and one for manual handling (KIM-MHO) (Klussmann et al., 2017). The assessment is carried out in two stages – first, a description of the workload items is carried out based on an ordinal scale. Then, the degree of probability of physical overload is evaluated (Steinberg, 2012).

Another standard ergonomic risk assessment method is motion capture technology – a process of digital movement monitoring that falls into the category of direct ergonomic measurement, where depth sensors are used to capture human movement. This technology evaluates current ergonomic tools such as RULA and REBA. The result of use is accurate and detailed data about the performed movement (Yunus et al., 2021). Most recent studies on motion sensing use non-optical sensing rather than optical (using cameras). Optical sensing is very expensive and complicated to set up, but the sensing is more accurate than non-optical motion sensing (Yunus et al., 2021). Due to the time and professional demands of identifying and evaluating ergonomic risks, a new 2D method automatically classifies workers' positions for ergonomic evaluation. The method is based on classification algorithms that learn different poses from virtual images and then identify the poses in real-world images. This new method can potentially automate ergonomic risk analysis in various work tasks – experimental tests have shown 89% position classification accuracy (Seo and Lee, 2021).

The author's team chose the manufacturing industry for their research, as it is the backbone of the Czech economy. The critical industry for the Czech Republic is the production of motor vehicles and means of transport – it accounts for approximately 4.6% of the national GDP (Kovanda, 2022). Despite the obstacles associated with the coronavirus crisis, the manufacturing industry is slowly returning to its pre-pandemic state. A key challenge is to combat labor shortages (Deloitte, 2022). Low unemployment causes labor productivity to grow more slowly than wages, which can ultimately lead to a decrease in the Czech Republic's international competitiveness (Procházková et al., 2021). Overall, the manufacturing industry needs to consider not only production efficiency and technological progress but also work ergonomics and employee health to ensure long-term sustainability and competitiveness. The author's team assumes that the level of monitoring and evaluation of ergonomic risks needs to be increased in manufacturing industry enterprises.

Industry 4.0 and lean management are both concepts that focus on optimizing processes and increasing efficiency in an industrial environment. Industry 4.0 is characterized by automation, digitization, and modern technologies. Lean management is a management philosophy that focuses on eliminating waste and improving processes for the customer's benefit. Industry 4.0 and ergonomics present challenges for the manufacturing industry related to technological progress and the human factor. This is primarily the implementation of automation and digitization when new technologies such as robots or artificial intelligence are introduced with the development of Industry 4.0. The manufacturing industry must find ways to effectively integrate these technologies into the production process to improve productivity while minimizing the risk of occupational injuries and health problems. As mentioned above, ergonomics is critical in preventing occupational injuries and diseases related to the work environment. This is also confirmed by a study by Pech and Vaněček (2022). According to their research, the perceived benefits of implementing Industry 4.0 differ among managers depending on the size of their enterprises. Industry 4.0 principles are generally more likely to be implemented in larger enterprises. In large enterprises, the emphasis is mainly on production and technological advantages, but the advantages of working conditions are significant in small and medium-sized enterprises. Managers see major benefits for business efficiency, work environment, production and management. If the company sticks to existing technologies, it can mean exclusion from the main supply chain in the market (Pech and Vaněček, 2022).

Enterprises must ensure that workstations and equipment are designed with ergonomic principles in mind and meet the individual needs of workers. Employee training and education are also prerequisites. With new technologies and changes in work processes, it is essential to ensure that employees are adequately trained and informed about safety procedures and ergonomic recommendations. Training employees can help minimize the risks of occupational accidents and improve their work environment. Attention must also be focused on the new generation of workers (Generation Z), which already expects safe workplace educational opportunities and emphasizes the need for flexibility and meaningful employment (Kozová et al., 2024). Other changes in the labor market and the need to adapt to the new requirements of the coming generation were published by Grenčíková et al. (2024).

Materials & Methods

A literature investigation preceded the research in the manufacturing industry. A systematic literature review was created using 42 indexed articles. The main focus was on primary terminology, ergonomics, ergonomic risks, and tools for managing these risks.

The classification of small and medium-sized enterprises, according to the European Commission, was used for the research. Small enterprise (1-49 employees), medium enterprise (50-249 employees), and large enterprise (250 and more employees). The categorization criterion for the selection of enterprises was the manufacturing industry. The Albertina database provided enterprise contacts. Quantitative research was used to obtain the required data, specifically a self-constructed questionnaire survey. The structured questionnaire contained a total of 19 closed questions. The questionnaires were distributed electronically through the online platform Survio from March to June 2023. The questionnaires were sent to 469 enterprises, of which 88 were returned and filled in. Thus, the return rate of the questionnaires was 18.8%. The most significant number of enterprises, 69.3%, belonged to the category of large enterprises (more than 250 employees), 18.2 % to the category of medium-sized enterprises (50-249 employees), 6.8% to the category of micro-enterprises (1-9 employees) and 5.7% to the category of small enterprises (10-49 employees). In terms of production and non-production processes, the most significant number of enterprises belonged to serial production (53.4%), then to mass production (21.6%), to piece production (18.2%), and the least to business intermediary – services (6.8%).

Basic descriptive statistics were used to process the obtained data. Nonparametric statistical analysis (Fisher's exact test) was used to evaluate response levels (Hendl, 2012). All tests were performed at the 5% significance level and were two-sided. The p-value procedure and statistical software IBM SPSS Statistics, version 26, were used to decide whether or not to reject the null hypothesis.

Results

The author's team constructed two research questions:

How Czech companies in the manufacturing industry monitor ergonomic risks and through which methods?

Is there a difference in the monitoring of ergonomic risks in enterprises that have established lean management?

Table 1 lists the methods of mapping ergonomic risks for operators in production according to lean management methods. The data shows that enterprises also use some methods for evaluating ergonomic risks without lean management. 23.8% of enterprises without lean management use a checklist for primary ergonomic risks. They do not monitor other ergonomic risks. From the perspective of enterprises that have established lean management methods, they often use a checklist for primary ergonomic risks. This method is used by 56.7% of enterprises with lean management (38 responses). RULA, REBA, and Key Indicator Methods (KIM) are insufficiently implemented. No one reports Shoaf's Model Methods. 35.8% of monitored enterprises implementing lean management (24 responses) state that they do not monitor ergonomic risks.

Enterprises in the manufacturing industry do not sufficiently use methods for evaluating ergonomic risks. At the same time, it turned out that enterprises implementing lean management monitor ergonomic risks, at least with the help of a checklist.

The author's team also set out to find out if there is a statistical dependence between the size of the enterprise and the application of methods for monitoring ergonomic risks.

H0: The methods used to assess ergonomic risks are independent of the size of the enterprise.

H1: The methods used to assess ergonomic risks depend on the size of the enterprise.

Table 2 shows the ergonomic risk mapping methods depending on the enterprise's size. Small enterprises implementing lean management (1 company) do not map ergonomic risks. The share of medium-sized enterprises that do not map ergonomic risks is 36.4% (4); for large enterprises, it is 34.5% (19).

The most frequently mentioned method: The checklist for primary ergonomic risks is used by 54.5% of medium enterprises and 58.2% of large enterprises.

If they have already mapped the ergonomic risks, the shares for individual methods will be very balanced between enterprises and will not depend on the enterprise's size (see modified Fisher's exact test; Table 3).

The results of Fisher's exact tests are shown in Table 3. The first column of this table shows the relevant method for evaluating ergonomic risks, and the second column shows the p-value of Fisher's exact test. Given that the p-value is generally higher than the significance level $\alpha = 0.05$, we do not reject the null hypothesis about ergonomic risk methods' independence and the enterprise's size.

Another examined dependency was the relationship between the type of manufacturing enterprise and the application of ergonomic risk monitoring methods.

H0: The methods used to assess ergonomic risks are independent of the type of manufacturing enterprise.

H1: The methods used to assess ergonomic risks are dependent on the type of manufacturing enterprise.

Table 4 shows methods mapping ergonomic risks for operators in production according to the type of production or non-production processes. Ergonomic

Table 1

Monitoring ergonomic risks according to the implementation of lean management principles (source: own research)

Methods mapping ergonomic risks for operators in production		Do you use lean management methods? Yes	No	Total
Checklist for basic ergonomic risks	Yes	38 (56.7%)	5 (23.8%)	43 (48.9%)
	No	29 (43.3%)	16 (76.2%)	45 (51.1%)
	Total	67 (100%)	21 (100%)	88 (100%)
RULA	Yes	6 (9%)	0 (0%)	6 (6.8%)
	No	61 (91%)	21 (100%)	82 (93,2%)
	Total	67 (100%)	21 (100%)	88 (100%)
REBA	Yes	2 (3%)	0 (0%)	2 (2.3%)
	No	65 (97%)	21 (100%)	86 (97.7%)
	Total	67 (100%)	21 (100%)	88 (100%)
Job Strain Index (JSI)	Yes	2 (3%)	0 (0%)	2 (2.3%)
	No	65 (97%)	21 (100%)	86 (97.7%)
	Total	67 (100%)	21 (100%)	88 (100%)
Key Indicator Methods (KIM)	Yes	4 (6%)	0 (0%)	4 (4.5%)
	No	63 (94%)	21 (100%)	84 (95.5%)
	Total	67 (100%)	21 (100%)	88 (100%)
Shoaf's Model methods	Yes	0 (0%)	0 (0%)	0 (0%)
	No	67 (100%)	21 (100%)	88 (100%)
	Total	67 (100%)	21 (100%)	88 (100%)
Ergonomic risks are not monitored	Yes	24 (35.8%)	16 (76.2%)	40 (45.5%)
	No	43 (64.2%)	5 (23.8%)	48 (54.5%)
	Total	67 (100%)	21 (100%)	88 (100%)

Table 2
Ergonomic risks by enterprise's size (source: own research)

Methods mapping ergonomic risks for operators in production		Enterprise's size by employees			
		Small enterprise (10 – 49 employees)	Medium enterprise (50 – 249 employees)	Large enterprise (250 or more employees)	Total
Checklist for basic ergonomic risks	Yes	0 (0%)	6 (54.5%)	32 (58.2%)	38 (56.7%)
	No	1 (100%)	5 (45.5%)	23 (41.8%)	29 (43.3%)
	Total	1 (100%)	11 (100%)	55 (100%)	67 (100%)
RULA	Yes	0 (0%)	1 (9.1%)	5 (9.1%)	6 (9%)
	No	1 (100%)	10 (90.9%)	50 (90.9%)	61 (91%)
	Total	1 (100%)	11 (100%)	55 (100%)	67 (100%)
REBA	Yes	0 (0%)	0 (0%)	2 (3.6%)	2 (3%)
	No	1 (100%)	11 (100%)	53 (96.4%)	65 (97%)
	Total	1 (100%)	11 (100%)	55 (100%)	67 (100%)
Job Strain Index (JSI)	Yes	0 (0%)	0 (0%)	2 (3.6%)	2 (3%)
	No	1 (100%)	11 (100%)	53 (96.4%)	65 (97%)
	Total	1 (100%)	11 (100%)	55 (100%)	67 (100%)
Key Indicator Methods (KIM)	Yes	0 (0%)	1 (9.1%)	3 (5.5%)	4 (6%)
	No	1 (100%)	10 (90.9%)	52 (94.5%)	63 (94%)
	Total	1 (100%)	11 (100%)	55 (100%)	67 (100%)
Shoaf's Model methods	Yes	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	No	1 (100%)	11 (100%)	55 (100%)	67 (100%)
	Total	1 (100%)	11 (100%)	55 (100%)	67 (100%)
Ergonomic risks are not monitored	Yes	1 (100%)	4 (36.4%)	19 (34.5%)	24 (35.8%)
	No	0 (0%)	7 (63.6%)	36 (65.5%)	43 (64.2%)
	Total	1 (100%)	11 (100%)	55 (100%)	67 (100%)

Table 3
Results of modified Fisher's exact test – ergonomic risks by enterprise's size (source: own research)

Modified Fisher's exact test	p-value
Checklist for basic ergonomic risks	0.725
RULA	1.000
REBA	1.000
Job Strain Index (JSI)	1.000
Key Indicator Methods (KIM)	0.555
Shoaf's Model methods.	X
Ergonomic risks are not monitored	0.553

risks are not monitored by 57.1% of enterprises (24 responses), 31% of enterprises with serial production (13 enterprises), 41.2% of enterprises with mass production (7 enterprises), 66.7% of piece production (4 enterprises), and no enterprise with services. Most often, they again use the checklist for primary ergonomic risks. This method is used by 57.1% of serial production, 58.8% of mass production, and 33.3% of piece production; for business services, it is 100% of enterprises (2 enterprises). Although it does not seem so, when enterprises use ergonomic risk mapping methods, according to a modified Fisher's exact test, the type of method does not statistically depend on the type of enterprise.

From the results of the Fisher's tests shown in Table 5, it is clear that we do not reject the null hypothesis at the significance level $\alpha = 0.05$ (the p-values are more significant than the significance level $\alpha = 0.05$ for all tests). With a 95% probability, it can be said that ergonomic risk mapping methods do not statistically depend on the type of enterprise.

Table 4
Ergonomic risks by type of production (source: own research)

Methods mapping ergonomic risks for operators in production		Type of production processes				
		Serial production	Mass production	Piece production	Business intermediary – services	Total
Checklist for basic ergonomic risks	Yes	24 (57.1%)	10 (58.8%)	2 (33.3%)	2 (100%)	38 (56,7%)
	No	18 (42.9%)	7 (41.2%)	4 (66.7%)	0 (0%)	29 (43.3%)
	Total	42 (100%)	17 (100%)	6 (100%)	2 (100%)	67 (100%)
RULA	Yes	6 (14.3%)	0 (0%)	0 (0%)	0 (0%)	6 (9%)
	No	36 (85.7%)	17 (100%)	6 (100%)	2 (100%)	61 (91%)
	Total	42 (100%)	17 (100%)	6 (100%)	2 (100%)	67 (100%)
REBA	Yes	2 (4.8%)	0 (0%)	0 (0%)	0 (0%)	2 (3%)
	No	40 (95,2%)	17 (100%)	6 (100%)	2 (100%)	65 (97%)
	Total	42 (100%)	17 (100%)	6 (100%)	2 (100%)	67 (100%)
Job Strain Index (JSI)	Yes	2 (4.8%)	0 (0%)	0 (0%)	0 (0%)	2 (3%)
	No	40 (95.2%)	17 (100%)	6 (100%)	2 (100%)	65 (97%)
	Total	42 (100%)	17 (100%)	6 (100%)	2 (100%)	67 (100%)
Key Indicator Methods (KIM)	Yes	2 (4.8%)	1 (5.9%)	0 (0%)	1 (50%)	4 (6%)
	No	40 (95.2%)	16 (94.1%)	6 (100%)	1 (50%)	63 (94%)
	Total	42 (100%)	17 (100%)	6 (100%)	2 (100%)	67 (100%)
Shoaf's Model methods	Yes	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	No	42 (100%)	17 (100%)	6 (100%)	2 (100%)	67 (100%)
	Total	42 (100%)	17 (100%)	6 (100%)	2 (100%)	67 (100%)
Ergonomic risks are not monitored	Yes	13 (31%)	7 (41.2%)	4 (66.7%)	0 (0%)	24 (35.8%)
	No	29 (69%)	10 (58.8%)	2 (33.3%)	2 (100%)	43 (64.2%)
	Total	42 (100%)	17 (100%)	6 (100%)	2 (100%)	67 (100%)

Table 5
Results of modified Fisher's exact test – ergonomic risks by type of production (source: own research)

Modified Fisher's exact test	p-value
Checklist for basic ergonomic risks	0.541
RULA	0.416
REBA	1.000
Job Strain Index (JSI)	1.000
Key Indicator Methods (KIM)	0.197
Shoaf's Model methods.	x
Ergonomic risks are not monitored	0.303

Discussion

As the literature review states, introducing Industry 4.0 and lean management methods optimizes production processes and increases efficiency. However, taking care of employees and monitoring health and safety and their work environment is just as important. Monitoring working conditions and ergonomics to minimize the risk of occupational accidents and diseases is crucial. There are several other reasons for recording ergonomic risks. As already mentioned, it primarily concerns the health and well-being of employees. Another advantage is that an ergonomically correct workplace increases work efficiency (Al-Zuheri et al., 2023; Widodo et al., 2020). Monitoring and preventing adverse effects of ergonomic risks is a legal requirement for health and safety at work, often the only prevention of legal disputes and sanctions. Empirical research shows that most enterprises need to be made aware of these facts and engage in ergonomic risk assessment. Managing ergonomic risks can also have economic benefits (Bevan, 2015), including reducing absenteeism costs or turnover.

Jazani et al. (2018) state that synergy can be achieved between lean management and ergonomics but note, that only some studies are up-to-date. This synergy is also demonstrated by Brito et al. (2019), who tested the implementation of lean manufacturing methods and aspects of safety and ergonomics at several workstations. Also, a study by Al Zuheri et al. (2023) demonstrates that increasing enterprises recognize the potential impact of combining ergonomics with lean manufacturing implementation on improving workers' productivity and reducing work-related risks. Using robots is another possible way to increase operational performance and simultaneously increase the quality and safety of work at the workplace. Colim et al. (2021) state that collaborative robotics is an innovative solution to reduce ergonomic concerns and improve manufacturing productivity, among other emergent technologies.

Therefore, monitoring ergonomic risks is not only a matter of compliance with regulations but represents a comprehensive approach to employee care, optimizing the work environment, and overall improvement of the organization's performance. There are many ways to increase awareness of ergonomic hazards and their identification and assessment. Czech enterprises should take advantage of the opportunity.

Conclusions

Based on the research results, the level of ergonomic risk monitoring in enterprises that do not have lean management implemented is insufficient (only 23.8%). Enterprises implementing lean management use the checklist for primary ergonomic risks (56.7%). It regrettable that enterprises do not use available methods to eliminate ergonomic risks. Enterprises in the manufacturing industry should approach ergonomic risks systematically and preventively. Enterprises should also implement the same elements of risk management in the case of ergonomic risks. First, it is essential to identify ergonomic risks in the work environment. This may include the analysis of work procedures, the physical environment, work demands, and movement stereotypes precisely through the methods above (RULA, REBA, JSI, KIM, Shoaf's Model methods). Once risks have been identified, it is essential to assess them to determine their severity and likelihood of occurrence. In this way, measures for their elimination or minimization can be prioritized. Based on the risk assessment, enterprises should design and implement measures to prevent ergonomic problems. This may include adjusting work procedures, ergonomically designing workstations, selecting appropriate technology and tools, or organizing work. Employee training is related to all of this. Employees should be properly educated in the prevention and resolution of ergonomic risks. They should be informed about correct work practices, ergonomic aids, and possible health consequences of inappropriate work.

Last but not least, it is essential to monitor the effectiveness of the implemented measures regularly and evaluate the ergonomic conditions in the company regularly.

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