

THE ROLE OF ERGONOMICS IN ENHANCING EMPLOYEE WELLNESS AT AUTOMOTIVE SECTORS

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Abstract

This article deals with the concept of ergonomics (from the Greek word ergon meaning work, and nomoi meaning natural laws), is the science of enhancing the design of products to optimize them for human use. Human dynamics, such as height, weight, and proportions are taken into consideration, as well as factors such as human hearing, vision, temperature preferences, and so on. Ergonomics is sometimes known as human engineering. In the era of Digital Explosion, Computers and related products, such as computer tables and chairs, are dominantly the stress point of ergonomic design. Employees at work place use these products and designs for a long span of time. The study of Ergonomics is essential because when you're doing a job and your body is under pressure by an unscientific posture, intense temperature, or repeated movement your musculoskeletal system is adversely affected. Our body may develop symptoms such as fatigue, discomfort, and pain, which can be the early signs of a musculoskeletal disorder.

Keywords: *Ergonomics, Wellness, Productivity, Organizational Commitment, Workplace, Health and Safety.*

Introduction

Ergonomics focuses on designing and arranging the workplace to fit the needs of the human body, optimizing comfort, productivity, and overall well-being. By implementing ergonomic principles, employers can create a healthier and more efficient workspace for their employees. The nature of work in modern society is changing rapidly, and competition in the job market is getting more intense. This requires competence from workers and demands them to update their knowledge, skills, and attitudes in order to remain productive and retain their attractiveness in the job market. On the other hand, skillful employees are a company's most important competitive assets, and so it is worth to up-skill the employees by providing training at regular intervals on process and also on governing themselves from workplace illness. Thus, the present study is an attempt to create awareness on ergonomics that impact employee performance. The significance and prominent role of ergonomics is reviewed by discussing its association with other scientific disciplines and by ascribing types of ergonomics and its principles and applications towards employee wellness. Branches of ergonomics that are still developing, such as contentment, ease or cognitive engineering, have been tentatively considered in the context of this competitiveness, as a means of adding use related value to products.

Review of Literature

Neubert, Papetti, Domínguez-Alfaro et al., Hendrick, (2003).

With the advancement of manufacturing technologies, there has been a growing need for more holistic work system design. In this regard, companies' development processes should address a holistic macroergonomics system perspective where employees, work processes, methods, systems, environments, tools, machinery and equipment, and the output products and services are all simultaneously considered. Usually this requires that microergonomics knowledge is systematically applied with a macroergonomics holistic development approach. In that respect, in manufacturing, ergonomics is, however, often considered too narrowly only from a health and safety development perspective, and not for productivity development, hence neglecting the potential it could have from a business performance development perspective. Often, the need for ergonomics development arises only from the need to reduce costs associated to occupational health and safety, for instance, by minimizing the number of musculoskeletal disorders (MSDs).

However, it is not always understood that these development activities may also improve work productivity.

Wickens and Hollands, Hollnageland Woods, (2007)

Cognitive ergonomics studies cognition in the workplace and operational settings, so as to augment human well-being performance and at the same time system performance too. It is a subdivision of the grander field of human capital and ergonomics. In any work system, the workers and their environment should be considered as an extremely interactive joint cognitive system. The cognitive ergonomics focuses on cognitive processes in the design of environment and technology. Furthermore, employee well-being in terms of positive outcomes such as job satisfaction, happiness, organizational commitment, intention to remain with the organization, work engagement, sense of purpose, and affective wellbeing. It is based on human perception, mental processing, and memory information. As these may relate to human-system design, relevant topics include mental workload, decision-making, skilled performance, human-computer interaction, human reliability, work stress, and training.

Macpherson et al., 2018; Mustard et al., (2015)

Work-related musculoskeletal disorder (MSD) prevention and psychological health & safety are priority areas for workplaces, given their large influence on worker health and productivity. Trends in compensation injury claim data suggest, despite strong prevention efforts, that MSDs remain the leading cause of lost time injury claims and work-related disability. Similarly, psychological injuries attributed to the workplace, including stress, anxiety, depression, and burnout, have emerged as growing concerns in current work contexts, with mental stress claims having the largest cost per claim and most lost days per claims.

Vimalanathan & Babu, (2017)

A dynamic link between HRM, ergonomics, and work psychodynamics produces significant theoretical hypotheses that should be investigated in further study. Employee health issues, work environment design, shift work, humidity, and working hours all require

careful consideration, especially given their strong associations with the effects of workplace stress. The productivity of computer operators is significantly and favorably impacted by ergonomic considerations.

Organizational ergonomics, cognitive ergonomics, and environmental ergonomics all have a greater impact on productivity. Furthermore, as rightly mentioned how to enhance performance at work and how cognitive ergonomic practices assist job performance in knowledge work is crucial question.

Boff, Carayon, Punnett, Gualtieri, Reiman, Slama et al (2020)

Work and work processes are constantly being developed in the manufacturing industry to ensure production performance and efficiency. These development activities, often technology-dominated and business-oriented, can provide a competitive edge for the company through the introduction of new and advanced technologies and automation. There is, however, a threat to successful performance and employee well-being if human-system and human-technology interfaces are not designed with enough deep ergonomics expertise. The potential benefits for ergonomics development in the manufacturing industry can be significant when these challenges are handled with the right approach.

Sakthi Nagaraj & Jeyapaul, Ajmal, Kwon (2021)

From the review of cognitive ergonomics on Employee Well-being, it is observed that organizational ergonomics are less effective than physical ergonomics at improving lean performance where the least amount of impact cognitive ergonomics has on improving lean performance To determine organizational, familial, or societal factors that help reduce perceived occupational stress and improve job performance and job satisfaction, a negative association between psychological well-being and felt workplace stress, and a moderate negative correlation was discovered between each of the subscales of perceived workplace stress. On the other hand, burnout and stress are caused by job expectations, which can be reduced by workplace resources. As a consequence, staff may be more engaged in their work. Determinants of safety performance, the process of safety improvement is ongoing when businesses take real actions, including safety training and the consequences of acquired knowledge and skills, things go better.

Zolotova & Giambattista, (2019); Gangopadhyay, (2022)

Cognitive ergonomics as being concerned with mental processes such as perception, memory, reasoning and motor response, as they affect interactions among human and others elements of a system. Cognition and Ergonomics indicate the cognitive aspects of the interaction between the people, the work system and the artefact where the intention of designing them so that the interaction is effective. The cognitive processes such as perception, learning as well as problem solving play an important role in the interaction with artefacts and they must be considered to explain the cognitive tasks that people perform. Cognitive analysis of interaction has been implemented by applying theoretical models of human cognitive processes proposed by cognitive psychologists.

Adiga, Usha (2023)

Ergonomics in industrial and manufacturing settings is a specialized application of ergonomic principles to optimize the design of work environments, processes, and equipment. This field aims to create conditions that enhance worker safety, productivity, and well-being while minimizing the risk of injuries, accidents, and errors. The physical demands and complexities of industrial and manufacturing tasks require careful ergonomic considerations to ensure the health and performance of workers. Industrial and manufacturing environments are often characterized by repetitive tasks, heavy machinery operation, and exposure to potential hazards. Applying ergonomic principles is crucial for several reasons: Industrial tasks involve lifting heavy objects, operating machinery, and performing repetitive motions, all of which can lead to musculoskeletal injuries if not properly managed. Proper ergonomic design reduces the risk of accidents by minimizing human errors, improving visibility, and ensuring that equipment is appropriately positioned and labeled.

Research Objectives**Primary**

- To study the long-term benefits of ergonomics on workforce sustainability and organizational performance.

Secondary

- To assess the impact of workplace ergonomics on employee health and wellness.
- To measure employee awareness and perception of ergonomic practices in the organization.

Research Methodology

This study is descriptive, analyzing the impact of ergonomic practices on employee wellness and productivity in manufacturing. Data was collected via structured surveys from 102 middle management employees, using a 5-point Likert scale and ranking-based questions. The study examined ergonomic tools, employee comfort, health outcomes, and productivity. The research would likely involve gathering information on various aspects such as ergonomic tools and setups, employee comfort levels, health outcomes, productivity metrics, and feedback on current practices. The findings will help paint a detailed picture of the role of ergonomics in fostering a healthier and more productive workforce, offering actionable insights for improvement.

Data Analysis and Interpretation

The data collected were analysed using percentage analysis and summarized analysis of impact of ergonomics practises on employees have been represented below. Each aspect was found out through specific questions designed to collect the respondents' views and opinions.

Descriptive Statistics

Age

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	40	39.2	39.2	39.2
	2	16	15.7	15.7	54.9
	3	34	33.3	33.3	88.2
	4	8	7.8	7.8	96.1
	5	4	3.9	3.9	100.0
	Total	102	100.0	100.0	

Experience

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	18	17.6	17.6	17.6
	2	34	33.3	33.3	51.0
	3	12	11.8	11.8	62.7
	4	18	17.6	17.6	80.4
	5	20	19.6	19.6	100.0
	Total	102	100.0	100.0	

Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	72	70.6	70.6	70.6
	2	30	29.4	29.4	100.0
	Total	102	100.0	100.0	

T-Test for Employee Awareness on Ergonomics

H0: There is no significant difference between awareness on ergonomics and gender of respondents.

H1: There is no significant difference between awareness on ergonomics and gender of respondents.

Interpretation

An independent t-test revealed no significant difference in awareness on ergonomics between male and female respondents, ($p = 0.295 > 0.05$).implying that gender does not play a significant role in analysing awareness based on gender of the employees. Hence, H0 is accepted showing there is no significant difference between awareness on ergonomics and gender of respondents. Around 91% of the respondents are aware of the current ergonomic practises effectively implemented in the organization whereas 9% of them are not aware of it. Employees perceive ergonomic factors and tools as an important part of their wellness in the organization which helps them to perform better and increase productivity by getting comfortable with their work.

ANOVA Test for Employee Perceptions on Ergonomics

H⁰: There is no significant relationship between employee perceptions of ergonomics and work experience of the respondents.

H¹: There is significant relationship between employee perceptions of ergonomics and work experience of the respondents.

Interpretation

A significant relationship was found ($F = 8.158, p < 0.05$), suggesting that employees with more experience tend to benefit more from ergonomic interventions and perceive the benefits clearly. Hence, H1 is accepted showing there is significant relationship between employee perceptions of ergonomics and work experience of the respondents.

Correlation Analysis Over Impact of Ergonomics on Employee Health

Attributes/Scale	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Total
I feel my posture has improved	35.3	43.1	19.6	1.96	0	100
I experience less muscle strain.	27.4	39.2	27.4	5.9	0	100
I feel less work burnout	19.6	41.2	39.2	0	0	100
I have less eye strain due to the setup at my desk	17.6	41.2	33.4	7.8	0	100
I feel less fatigue than before	17.6	41.2	37.3	3.9	0	100

H₀: There is no relationship between workplace ergonomics and its impact on employee health.

H₁: There is a relationship between workplace ergonomics and its impact on employee health.

Interpretation

A strong positive correlation was found between ergonomics and employee health (Pearson correlation = 0.619, $p < 0.05$). This indicates the implications of ergonomics over long term health of employees. Around 78.4% of employees feel that their posture has improved, indicating that ergonomic interventions such as proper seating arrangements and posture support have been effective. A certain amount of respondents agree that they experience less muscle strain, showing that ergonomics positively affects musculoskeletal health.

Regression Analysis Over Importance of Environmental Factors

Attributes/Ranks	1	2	3	4	5	Total
Proper seating and posture support	68	16	12	4	2	102
Adequate lighting	82	20	0	0	0	102
Wellness sessions	20	34	26	14	8	102
Availability of resources	18	26	38	14	6	102
Workspace layout and design	20	46	16	16	16	102

H₀: There is relationship between environmental factors and impact over well-being and productivity of the employees.

H₁: There is relationship between environmental factors and impact over well-being and productivity of the employees.

Interpretation

A regression model was used to evaluate the impact of different ergonomic factors on employee performance:

- Proper Seating and Posture Support (Beta = 0.387, $p < 0.05$)
- Adequate Lighting (Beta = 0.257, $p < 0.05$)
- Wellness Sessions (Beta = 0.212, $p < 0.05$)

The model confirmed that ergonomic improvements have a statistically significant impact on employee performance and well-being. The results indicated a statistically significant model ($F = 30.035$, $p < 0.05$), confirming that the various environmental factors and physical factors of the organization have a strong collective impact on employee well-being. H1 is accepted. There is relationship between environmental factors and impact over well-being and productivity of the employees.

Findings

Ergonomic interventions correlate positively with employee well-being and productivity. Employees with higher awareness of ergonomic practices reported greater job satisfaction and reduced work-related fatigue. Adequate workstation design, lighting, and posture support significantly enhance performance and efficiency. Companies should invest in ergonomic training programs to increase employee awareness. Implementing advanced ergonomic solutions such as sit-stand workstations can further improve worker comfort. Regular assessments and modifications should be carried out to ensure the effectiveness of ergonomic practices.

Limitations of the Study

The study is confined to a small sample of employees at automotive sectors which may not represent the broader manufacturing industry. A larger and more diverse sample could improve generalizability. The survey responses rely on employees' perceptions, which may be subjective or influenced by personal biases. The study captures data at a single point in time, making it difficult to assess the long-term impact of ergonomic interventions. The study focuses also on secondary data to highlight the importance of the topic.

Suggestions and Recommendations

Ensure tools and materials are within easy reach to minimize unnecessary movements. Encourage regular stretching and micro-breaks to prevent muscle fatigue. Use ergonomically designed tools and machinery to reduce strain and reduce repetitive tasks. Implement daily warm-up and stretching routines to prevent physical strain. Promote knowledge-sharing forums for employees to exchange ergonomic best practices. Equip screens with anti-glare filters and promote the 20-20-20 rule (every 20 minutes, look at something 20 feet away for 20 seconds). Use anti-fatigue mats for employees working in standing positions. Implement sit-stand workstations to allow flexibility in working positions. By adopting these ergonomic improvements, the automotive sector can enhance employee safety, reduce workplace injuries, and improve overall efficiency and job satisfaction.

Conclusion

Ergonomics plays a critical role in improving employee wellness, productivity, and safety in the automotive sector. A well-designed workplace that prioritizes proper seating, posture support, adequate lighting, and optimal workspace layout significantly reduces the risk of musculoskeletal disorders, fatigue, and work-related injuries. By integrating ergonomic practices, companies can foster a healthier and more engaged workforce. Additionally, implementing wellness programs, regular training, and encouraging proper posture techniques contribute to long-term employee well-being. As automotive sector jobs often involve repetitive tasks and prolonged standing or sitting, prioritizing ergonomics leads to a sustainable work environment that promotes both physical and mental health. In conclusion, a proactive approach to ergonomics is essential for enhancing employee wellness in the automotive industry. By continuously evaluating and improving workplace conditions, organizations can create a safe, comfortable, and productive environment that benefits both employees and overall business performance.

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