

Role of Ergonomics and Human Factors in Work Industry

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ABSTRACT:

The role of ergonomics and human factors in the workplace is crucial for enhancing both employee well-being and organizational performance. Ergonomics is the scientific study of designing work environments and tasks to align with workers' capabilities and limitations. Human factors, a closely related field, focuses on understanding human abilities, limitations, and behaviors to improve safety, efficiency, and productivity. In modern industries, ergonomics and human factors are essential for reducing physical strain, preventing injuries, and promoting overall employee health by ensuring appropriate workstation design, tool selection, and task organization. These principles also contribute to a safer work environment, boosting job satisfaction, reducing absenteeism, and improving morale. By integrating ergonomics and human factors, organizations can increase productivity and reduce operational costs by minimizing errors, optimizing workflows, and ensuring that employees can perform tasks without unnecessary physical or mental strain. In industries like manufacturing, healthcare, and office environments, these principles are applied to balance both physical and cognitive demands, ultimately driving organizational success and enhancing employee satisfaction. The ongoing development of ergonomics and human factors research continues to shape and improve workplace environments, making them safer, more efficient, and more supportive of employee well-being. The primary aim of this research paper is to explore the role of ergonomics and human factors in shaping the workplace.

Keywords: Ergonomics, Human factor, Difficulties in work place.

INTRODUCTION:

Ergonomics is the study of the interaction between workers and their working environment. It is crucial for workers to be aware of potential ergonomic risk factors in their workplace, as these risks can have severe consequences, such as injury or even death. Examples of such risk factors include repetitive motions, static postures, heavy lifting, forceful exertion, and exposure to excessive vibration, among others. If workers fail to recognize these risks, their safety and health may be jeopardized.

Occupational health and safety have always been a priority to minimize health risks, life-threatening hazards, and financial losses. These issues often arise from prolonged work in uncomfortable or awkward postures. The roots of ergonomics can be traced back to ancient civilizations, where the design of tools, furniture, and workspaces was influenced by considerations of human comfort and efficiency. The Industrial Revolution highlighted the need for better working conditions, leading to the rise of ergonomic practices. In the late 19th and early 20th centuries, several key figures contributed to the foundation of modern ergonomics. World War II played a significant role in the development of

ergonomics as a scientific discipline. During this time, societies and organizations dedicated to advancing ergonomics were formed. Over time, ergonomics found applications in industries such as healthcare, transportation, and product design, improving safety, comfort, and efficiency. The development of computer ergonomics and human-computer interaction further expanded the field. Ergonomics has evolved significantly, influenced by various disciplines and societal needs. From its early origins to its current multidisciplinary nature, ergonomics continues to be vital in enhancing human well-being and performance. By understanding its history, researchers and practitioners can build on past achievements and contribute to the field's future advancements.

Ergonomic principles can be applied not only in the workplace but also at home, during hobbies, or when helping friends and co-workers facing similar issues. The primary goal of ergonomics is to reduce human error, improve productivity, and enhance safety and comfort, with a particular focus on the interaction between humans and their work environment. Ergonomics is applied in organizations to design equipment, devices, and processes that are tailored to the human body's physical and cognitive capabilities. Effective use of people in social environments allows them to solve problems and address knowledge gaps.

OBJECTIVES:

- To promote the use of ergonomic design and raise awareness for improved employee performance in the workplace.
- To identify the factors influencing the implementation of ergonomics and human factors as tools to enhance employee performance in the work industry.
- To explore the various practices and methods of ergonomics adopted by organizations for different types of work.
- To analyze employees' work postures, repetitive movements, and their attitudes toward equipment design and maintenance.

REVIEW OF LITERATURE

The study highlights the significance of applied research in enhancing ergonomic practices within organizations. The future of ergonomics depends on its ability to adapt and address emerging challenges while remaining committed to creating work environments that prioritize human well-being. Ultimately, ergonomics must continue to focus on the human element, ensuring that technological advancements and organizational changes are consistently assessed for their effects on workers' health, well-being, and efficiency. **(silva.et.al 2024)**

The study emphasizes the importance of balancing the interactions between Humans, Machines, and the Environment, which plays a crucial role in the smooth and successful operation of an organization. It also revealed that ergonomics has a broad scope, encompassing various scientific disciplines. The study aimed to raise awareness about the different types of ergonomics and their application in the workplace. This would undoubtedly contribute to enhancing individual awareness of workplace ergonomics, while also improving organizational performance by promoting employee comfort, health, safety, and overall well-being. **(Anilambic Kata et.al 2020)**

The study found that office workers lacked awareness of office ergonomics, which contributed to poor posture and uncomfortable working conditions. Prolonged hours spent in static or awkward positions, coupled with poorly designed chairs, under-table storage, and improper placement of keyboards and

mice, along with the absence of footrests, were identified as the main causes of musculoskeletal issues. While most employees reported that lighting and the indoor environment were comfortable, many experienced difficulties with concentration and stress due to noise. Improving ergonomics and creating a more comfortable work environment could enhance employee satisfaction while simultaneously reducing musculoskeletal disorders (MSD). (Chandwani A et.al 2019)

RESULTS AND DISCUSSION

I. Socio-Economic Status

TABLE – 1
Classification of Respondents by Personal Characteristics
N=100

Characteristics	Category	Respondents	
		Number	Percent
Age group (years)	26-35	23	23.0
	36-40	41	41.0
	41-45	36	36.0
Gender	Male	50	50.0
	Female	50	50.0
Marital status	Married	70	70.0
	Unmarried	30	30.0
Occupation	Teacher/ Professor	25	25.0
	Engineer	30	30.0
	Administrative officer	10	10.0
	Computer operator	20	20.0
	Housekeeping workers	15	15.0
Experience	1-3years	25	25.0
	3-6 years	23	23.0
	6-9 years	30	30.0
	>9 years	22	22.0

The respondents are generally in their early to mid-career stage, with the highest concentration in the 36-40 age groups. This suggests that the survey may be capturing individuals who are more established in their careers, typically with more professional experience. The gender distribution is perfectly balanced, meaning the survey captures an equal number of male and female respondents. This suggests that the results can be generalized without gender bias. A significant majority (**70%**) of the respondents are married, which could suggest a higher level of stability or family responsibilities. The unmarried respondents make up **30%**, indicating that a considerable portion of the sample is still in single or non-married status.

The sample represents a variety of occupations. The largest group is engineers (**30%**), followed by teachers/professors (**25%**). A diverse mix of other occupations, including administrative and housekeeping workers, suggests a varied professional background among respondents. Most respondents (**30%**) have between 6-9 years of experience, with the second largest group (**25%**) having 1-3 years.

This suggests that the survey captures a mix of early-career professionals and those with more established careers. The distribution is fairly balanced, with fewer respondents in the >9 years category.

Table -2
Importance of Ergonomic Factors in the work place
N=100

Sl no	Criteria	No of respondents	
		Number	Percentage
1	Protecting staff from work related injury or ill health.	43	43.0
2	Improves the productivity.	33	33.0
3	Improving business performance and productivity.	24	24.0

A significant **43%** of respondents consider the protection of staff from work-related injuries or ill health as the most important aspect of ergonomics in the workplace. This indicates that the primary concern for a large portion of employees is ensuring their health and safety. One-third of the respondents (**33%**) believe that ergonomics plays an important role in improving productivity. This highlights the connection between comfort and efficiency. 24% of respondents view ergonomics as a factor that improves not only individual productivity but also overall business performance.

Table-3
Chairs are adequately adjustable during the work place
N=100

No.	Chairs adjustment during work place	Respondents	
		Number	Percent
1	Yes	90	90.0
2	No	10	10.0
	Total	100	100.0

If yes,

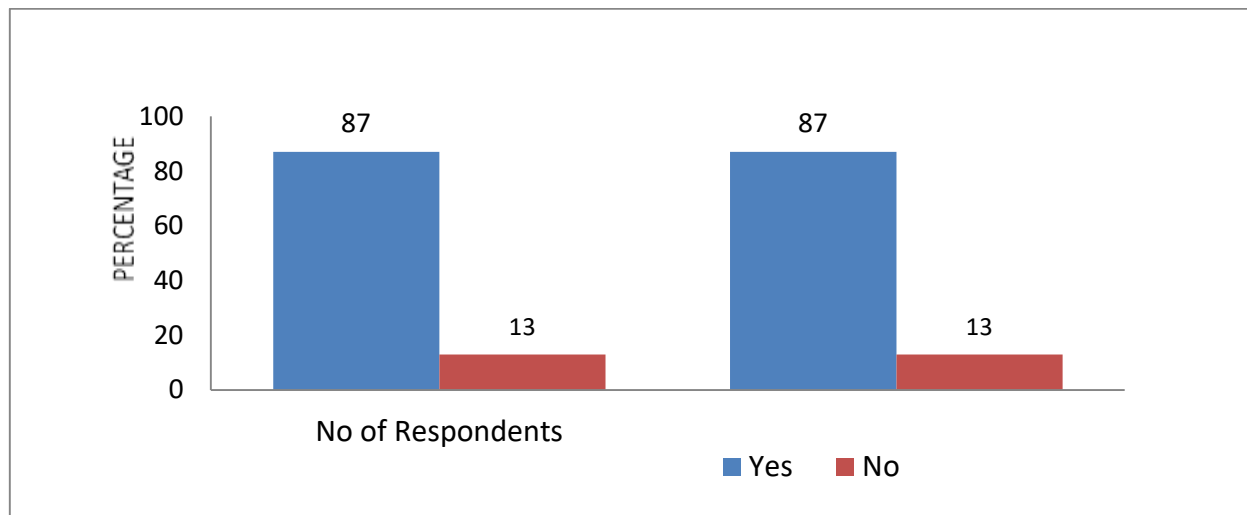
Criteria	No of respondents	
	Number	Percentage
Arm rest	22	22.0
Back rest	25	25.0
Seat rest	30	30.0
Shoulder rest	13	13.0

A large majority (**90%**) of respondents have access to chairs that are adjustable in their workplace, indicating that ergonomic considerations are largely prioritized in the workplace environment. However, **10%** of respondents still face challenges with non-adjustable chairs, which could lead to discomfort or improper posture. Only a small proportion (**22%**) of respondents have adjustable armrests, which can be important for reducing strain on the arms and shoulders during extended periods of sitting. A quarter of respondents have adjustable backrests, which are important for providing lumbar support and ensuring

proper posture. A larger proportion (**30%**) of respondents have chairs with adjustable seat rests, which is essential for ensuring the correct seating height and avoiding strain on the legs and lower back. Only a small percentage (**13%**) of respondents has adjustable shoulder rests, which is a more specialized feature.

Table-4
Extra storage comfortable for better desk organization
N=100

No.	Criteria	No of Respondents	
		Number	Percent
1	Yes	87	87.0
2	No	13	13.0
	Total	100	100.0



If yes,

Storage option	No of Respondents	
	Number	Percentage
Drawer Units	25	29.0
Sorting Trays	29	33.0
Separate cupboards	20	23.0
cubicle	13	15.0

The revealed **87% of respondents** indicated that they would prefer extra storage for better desk organization. **13% of respondents** did not want extra storage. majority (87%) of respondents see the need for extra storage to improve desk organization. Sorting trays are the most preferred storage option among those who want additional storage, with 33% of respondents selecting this choice. Drawer units come next with 29%. Separate cupboards and cubicles are less popular, each chosen by 23% and 15% of respondents, respectively.

Table-5
Workstation height is comfortable height for the employees
N=100

criteria	No of respondents	
	Number	Percentage
Yes	97	97.0
No	03	3.0

The table suggests that Majority (97%) of employees find the workstation height comfortable, suggesting that most of the workstations are set at an ergonomic or suitable height for the majority of the workforce. Only a small percentage (3%) of employees feels that the workstation height is not comfortable, indicating that while most are satisfied, there is still a small group that may require adjustments.

Table-6
Employee training on Ergonomics Factor
N=100

Sl no	Training domain	No of respondents	
		Number	Percentage
1	Proper posture	26	26.0
2	Proper work methods	23	23.0
3	When and how adjust their chairs	26	26.0
4	The importance of Stretching and regular breaks	25	25.0

26% of respondents received training on maintaining proper posture. This suggests that a significant portion of employees have been educated on the importance of posture, which is critical for preventing strain and injury, especially for those who sit for long periods. **23% of respondents** were trained on proper work methods. This indicates that a notable number of employees have been informed about efficient and ergonomic work practices that help reduce physical strain. **26% of respondents** received training on when and how to adjust their chairs. This is another essential aspect of ergonomic training, as chair adjustments directly affect posture, comfort, and overall health. **25% of respondents** were trained on the importance of stretching and taking regular breaks. This type of training encourages employees to incorporate movement throughout the day to reduce muscle tension and fatigue, which is important for long-term well-being.

Table-7
Perception towards work environment factor during the work

@multiple response

N=100

Sl no	Environment Factors	Respondents	
		Number	Percentage
1	Desk Organization	45	45.0
2	Lighting	37	37.0

3	Comfort	85	85.0
4	Noise Levels	40	40.0
5	Air Quality	60	60.0
6	Temperature	52	52.0
7	Aesthetics	60	60.0
8	Space and Privacy	54	54.0

85% of respondents consider comfort to be a key factor in their work environment. This is the highest percentage, emphasizing the importance of physical comfort in the workplace, which directly affects employee well-being and performance followed by air quality and aesthetics (60%). **54% of respondents** value space and privacy in their work environment. This factor seems important for providing employees with the freedom to work without feeling cramped or constantly observed which can foster greater productivity and mental comfort followed by temperature (52%). **Lighting (37%)** and **noise levels (40%)** are less of a concern for most employees.

Table-8
Seating position is recommended while working @multiple response
N=100

Sl no	Seating position	No of respondents	
		Number	Percentage
1	Standard Ergonomic Sitting	47	47.0
2	Slight Recline	75	75.0
3	Standing Desk	35	35.0
4	Kneeling Chair	45	45.0
5	Lounge Chair	72	72.0

The most commonly recommended seating positions are **slight recline (75%)** and **lounge chair (72%)**, reflecting a preference for comfort and a more relaxed posture while working. **Standard ergonomic sitting (47%)** and **kneeling chairs (45%)** are also popular, indicating that a significant number of employees still value traditional or posture-friendly seating options. **Standing desks (35%)** are less common but still preferred by some employees, indicating growing interest in reducing the negative effects of sitting for long periods.

Table-9
What is the impact of ergonomically designed workspaces on employee motivation and job satisfaction?
@multiple response
N=100

Sl no	Impact area	No of respondents	
		Number	Percentage
1	Reduced physical discomfort	87	87.0
2	Improved task completion speed.	76	76.0

3	Decreased errors and distractions.	56	56.0
4	Improved overall well-being.	90	90.0
5	More enthusiasm for tasks and responsibilities.	72	72.0
6	Employees are more likely to stay long-term.	77	77.0
7	Increased job satisfaction and morale.	84	84.0
8	Positive feedback on ergonomics.	80	80.0

The most significant impacts are **improved overall well-being (90%)** and **reduced physical discomfort (87%)** and, indicating that ergonomic workspaces have a primary focus on improving employee health, which is crucial for both productivity and long-term job satisfaction. **80% of employees** give positive feedback about ergonomics, showing that employees appreciate and recognize the benefits of ergonomic interventions in the workplace. **77% of respondents** believe that ergonomically designed workspaces help retain employees, suggesting that companies investing in ergonomics are likely to see better employee retention rates. There is a strong correlation between ergonomics and **task completion speed (76%)** and **enthusiasm for tasks (72%)**, highlighting that a comfortable workspace can enhance efficiency and motivation.

Table-10

How likely are you to stay in your current job because of the ergonomic conditions provided?

N=100

Sl no	Scale	No of respondents	
		Number	Percentage
1	Very unlikely	0	0
2	Unlikely	0	0
3	Neutral	15	15.0
4	Likely	75	75.0
5	Very likely	10	10.0

75% of respondents indicated that they are "likely" to stay in their current job because of the ergonomic conditions provided. This is the largest group, showing that most employees appreciate the ergonomic setup of their workspace enough to consider it a factor in their job retention. **15% of respondents** are neutral, meaning they neither agree nor disagree that ergonomics would influence their decision to stay in their current job. This group may feel that ergonomic conditions are not a significant factor in their decision-making process regarding job tenure. **10% of respondents** are "very likely" to stay in their current job due to the ergonomic conditions. This suggests that a smaller portion of employees places a high value on ergonomics, and it significantly influences their decision to remain with their employer. There is no group indicating that poor ergonomics would make them "unlikely" or "very unlikely" to stay, meaning that ergonomics are not a major negative factor for any respondents.

FINDINGS:

A significant portion (43%) of respondents identified the importance of ergonomics in preventing work-related injuries and improving employee health. Poor ergonomic awareness among office workers contributes to discomfort, stress, and musculoskeletal disorders (MSD).

90% of respondents reported improved well-being due to ergonomic interventions. 75% stated that ergonomic conditions positively influenced their willingness to stay in their current job.

90% of employees have access to adjustable chairs, but only a small percentage (22%) have adjustable armrests.

87% of respondents prefer additional storage to improve desk organization. 97% found their workstation height to be comfortable.

Comfort (85%) was ranked as the most crucial factor for an effective work environment, followed by air quality (60%) and workspace aesthetics (60%). A slight recline (75%) and lounge chairs (72%) were the most preferred seating positions.

SUGGESTIONS:

- Increase employee training on posture, workstation adjustments, and work techniques to minimize discomfort.
- Conduct workshops to raise awareness about the long-term health benefits of ergonomics.
- Organizations should provide adjustable chairs with enhanced lumbar support and armrests.
- Implement additional storage options like sorting trays and drawer units for better desk organization.
- Promote the use of standing desks to reduce sedentary work habits.
- Encourage regular stretching and micro-breaks to prevent strain and improve concentration.
- Improve lighting, noise control, and air quality to create a more comfortable and productive workspace.

CONCLUSION:

The study highlights the **critical role of ergonomics and human factors** in improving employee well-being, job satisfaction, and organizational productivity. Findings suggest that **ergonomic interventions lead to increased efficiency, reduced health risks, and higher retention rates** among employees. By investing in ergonomic training, workplace design improvements, and proper workstation arrangements, organizations can create a healthier and more efficient work environment.

Future research should explore **the long-term benefits of ergonomic interventions** and their impact on employee mental health and overall performance. Through continuous improvement and adoption of ergonomic best practices, workplaces can significantly enhance both employee well-being and operational success.

From the research it is identified that the equipments maintenance in the organizat

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