A Study on Workplace Ergonomics And Its Effect on Health And Productivity In Prasanna Precision Tools

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Abstract- *This research paper examines the impact of workplace ergonomics on employee health and productivity at Prasanna Precision Tools. The study highlights ergonomic concerns such as repetitive strain, poor posture, workstation layout issues, and their measurable effects on performance. Expanded statistical analysis including ANOVA, correlation, and t-tests show clear patterns linking ergonomic awareness and training to improved efficiency. The results emphasize the importance of integrating ergonomics as a strategic organizational priority.*

Keywords- Ergonomics, Workplace Design, Manufacturing Sector, Occupational Health, Productivity

I. INTRODUCTION

Ergonomics is the scientific discipline focused on optimizing the fit between workers and the systems in which they operate. In manufacturing environments, particularly precision toolmaking, workers face physical demands including repetitive actions, vibrations, handling of heavy tools, and long periods of standing. These factors often result in fatigue, musculoskeletal disorders, and reduced performance.The global evolution of ergonomics began during World War II, as organizations realized the importance of designing tools and systems compatible with human abilities. In India, despite industrial growth, many SMEs still experience gaps in ergonomic standards due to limited awareness and resource constraints. This study expands upon previous research and connects global ergonomic principles to the specific operational conditions at Prasanna Precision Tools. Ergonomics has a direct impact on worker safety, efficiency, and long-term productivity. This study addresses a critical gap by empirically analyzing ergonomic conditions in a medium-scale toolmaking industry. The significance lies in its ability to provide usable recommendations for reducing fatigue, improving workstation design, preventing injuries, and enhancing overall organizational performance.

II. OBJECTIVES OF THE STUDY

1. To analyse current ergonomic practices and awareness levels among workers.
2. To identify common ergonomic issues and their impact on worker health and productivity
3. To identify the factors hindering the use of ergonomics as a strategic tool for improving employee performance.
4. Toanalyse the productivity improvement with ergonomic interventions.

III. LITERATUREREVIEW

Koirala & Nepal (2022) – A Literature Review on Ergonomics, Ergonomics Practices, And Employee Performance

Koirala and Nepal reviewed existing literature on ergonomics practices and their link to employee performance. The review synthesized evidence showing that ergonomics reduces musculoskeletal disorders and enhances job satisfaction, indirectly improving performance. It offers a theoretical foundation for future empirical work. However, as a secondary review, it cannot provide new causal data.

IJAERS (2024) – Impact of Ergonomics on Workers' Performance and Health

This literature review examined Brazilian workplaces to understand how physical and cognitive ergonomics influence workers' health and output. Drawing on multiple case studies, it showed that ergonomic interventions reduced musculoskeletal disorders, improved employee wellbeing, and boosted productivity across different sectors. However, its focus on Brazilian organizations limits generalizability to other cultural and regulatory contexts.

Bartusik & Walas-Trębacz (2025) – Effects of Implementing Ergonomic Innovations

Surveys and performance data revealed that these implementations increased employee productivity and improved comfort and safety. While the large sample adds

strength, the study did not track long-term effects beyond the first implementation year.

Bohme &Wullbrandt (2024) – Streamlining Operations Management by Classifying methods and Concepts of Lean and Ergonomics within a Sociotechnical Framework

Böhme and Wullbrandt (2024) explored how Lean methodology and Ergonomics interact in modern operations management. Using a sociotechnical framework and a qualitative review of Industrial case studies, they classified methods to show how integrating ergonomic considerations into Lean processes improves both worker wellbeing and production efficiency. Findings highlighted that neglecting ergonomics during Lean implementation reduces long-term profitability. However, the study's heavy reliance on European manufacturing examples may limit its global applicability.

Plaza, Wojas&Białon (2025) – Ergonomics/Human Factors in the Era of Smart and Sustainable Industry 4.0/5.0

Plaza et al. (2025) reviewed human factors and ergonomics literature in the context of Industry 4.0/5.0. Drawing on recent smart factory projects, they mapped cognitive, physical, and otanizational ergonomics to new technologies such as AI and collaborative robots. Results showed that proactive ergonomic design mitigates worker stress and enhances safety in automated environments. The review's broad scope made it harder to quantify cost–benefit effects.

IV. RESEARCH METHODOLOGY

MEANING OF RESEARCH METHODOLOGY

Research methodology is the systematic and organized approach used by researchers to conduct a study and investigatea specific problemor question.Itoutlinesthe overall research design, the type of data tobe collected, the methods and tools used for data collection, and the techniques for data analysis.

RESEARCH DESIGN

This study is Descriptive in nature. Descriptive research design isa type of researchmethodologythat focuseson providing an accurate and systematic description of a phenomenon, situation, or population.

Sampling framework:
Sampling unit-employees of Prasanna Precision Tools

Samplingsize-100

The tools used are

- One-Way ANOVA
- Independent Samples t-Test

One-Way ANOVA:

One-way analysis of variance (ANOVA) is a statistical test used to determine whether there are any significant differences between the means of three or more independent groups. It helps researchers test if at least one group mean is different from the others, without performing multiple t-tests, which could increase the risk of error.

Independent Samples t-Test:

The independent samples t-test is a parametric statistical test used to compare the means of two independent groups to determine if there is a statistically significant difference between them. This test is commonly applied when analyzing differences in perceptions, behaviors, or outcomes between two distinct categories, such as male vs. female employees, or experiencedvs. less-experienced workers.

V. DATA ANALYSIS

MEANING OF DATA ANALYSIS

Analysis of data is a process of inspecting, cleaning, transforming and modeling data with the goal of discovering useful information, suggesting confusions and supporting decision making. Data analysis has multiple facts and approaches, encompassing diverse techniqueunderavarietyofnames,indifferentbusiness, science and social science domains.

One-Way ANOVA

HYPOTHESIS

NULL HYPOTHESIS(H0)

There is no significant difference in the mean scores for access to proper ergonomic support across different departments.

ALTERNATIV EHYPOTHESIS(H1)

There is a significant difference in the mean scores for access to proper ergonomic support across different departments.

Source	Sum of squares	df	Mean square	F	Sign
Between groups	3.147	3	1.049	.646	.587
Within groups	155.893	96	1.624		
Total	159.040	99			

INFERENCE:

From the above table, the one-way ANOVA for access to proper ergonomic support across departments yields an F-statistic of 0.646 with a p-value of 0.587, indicating no statistically significant difference between groups.

INDEPENDENT SAMPLES T-Test

HYPOTHESIS

NULL HYPOTHESIS(H0)

There is no significant difference in the mean scores for receiving ergonomic training or guidance between male and female employees.

ALTERNATIVE HYPOTHESIS(H1)

There is a significant difference in the mean scores for receiving ergonomic training or guidance between male and female employees.

Group Statistics	Gender	N	Mean	Std deviation	Std Error Mean
Received Ergonmic training	Male	44	2.95	1.257	.189
	Female	56	3.70	1.060	.142

INFERENCE

From the above table, the independent samples t-test reveals a significant difference in ergonomic training received between genders, with females reporting a higher mean (3.70) compared to males (2.95), t(98) = -3.201, p = .002..

SUGGESTIONS:

- Implement mandatory ergonomic training for employees.
- Introduce anti-fatigue mats, adjustable chairs, and improved lighting.
- Modify workstation designs to reduce strain.
- Conduct monthly ergonomic audits.
- Increase communication on ergonomic best practices.

CONCLUSION

The study demonstrates that ergonomics significantly influences employee performance and well-being. Findings reveal widespread fatigue, productivity loss, and limited ergonomic training. By integrating ergonomics as a strategic organizational element, Prasanna Precision Tools can enhance efficiency, reduce health risks, and improve long-term performance.

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