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Assessing Ergonomics Interventions at an Automotive Manufacturing Plant in South Africa

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Abstract

Ergonomics plays an important role in work safety, Productivity, and employee well-being, specifically in the manufacturing sector, where workers are exposed to repetitive tasks, heavy lifting, and prolonged standing. The study scrutinizes how ergonomic interventions affect employee performance in the South African manufacturing industry, in relation to the Automotive Manufacturing plant. Case studies, data analysis, and interviews of the manufacturing firm in question will be explored. The study identifies key ergonomic challenges and their impact on productivity, absenteeism, and workplace injuries. Findings give insights that poor ergonomics contributes to musculoskeletal disorders, reduced efficiency, and high turnover rates, while effective ergonomic measures improve worker health, morale, and overall productivity. The study recommends industry-wide ergonomic policies, improved worker training, and technological interventions to improve working conditions.

Keywords
Ergonomics, Automotive, Productivity

1. Introduction

The South African Manufacturing industry is a notable contributor to the economy, recruiting roughly 1.7 million workers. However, manufacturing jobs often involve physically challenging tasks such as lifting heavy materials, repetitive hand movements, and prolonged standing, which can lead to injuries and decreased productivity if ergonomic principles are not taken into account. Poor ergonomic conditions contribute to work-related musculoskeletal disorders (WMSDs), which account for nearly 38% of reported workplace injuries in the sector. (NIOSH, 2021).

1.1 Research Objectives

The study investigates the impact of ergonomic factors on employee performance in South Africa, mainly in the automotive industry. The key objectives are:

1. To assess the prevalence of ergonomic-related injuries in manufacturing workplaces.
2. To analyze how poor ergonomics affect productivity and job satisfaction
3. To identify effective ergonomic interventions that augment worker performance.
4. To provide industry-specific recommendations in South African Automotive manufacturing.

1.2 Problem Statement

The automotive manufacturing industry, particularly in high-demand environments such as The automotive plant is characterized by physical demanding tasks that place significant stain on workers often, tasks that often involve repetitive movements, long hours in fixed posture postures and the use of heavy machinery all contribute to a high

incidence of Musculoskeletal disorders (MSDs), fatigue and workplace injuries. (Karhu, Kansi & Kuorinka, 1981). As a result, these health issues not only reduce worker productivity but also lead to increased absenteeism, higher healthcare costs, and compromised product quality. (Cohen, 2000).

While ergonomic interventions have been widely recognized as effective strategies to mitigate these issues, the specific impact of such practices on employee performance, well-being and overall productivity within the South African automotive manufacturing context remains under-researched (Garten et al, 2020). The automotive plant has implemented several ergonomic measures such as adjustable work stations and task rotations with the goal of improving worker comfort and reducing injuries. (The automotive plant South Africa, 2023). However the effectiveness of these interventions in terms of tangible improvements on employee health performance and productivity has not been completely evaluated (Zohar & Luria, 2019). This study seeks to fill this gap by investigating the impact of ergonomic interventions on employee health, performance and productivity at The automotive plant South Africa Durban plant. By assessing both quantitative outcomes such as (injury rates, absenteeism, productivity metrics) and qualitative feedback such as (worker satisfaction, perceived comfort), this study aims to provide a complete analysis of the role of ergonomics in optimizing worker well-being and organizational performance in automotive manufacturing sector (Lehtola et al, 2022; Buss, 2021).

Key research problems

- The riskiness of MSDs and other health-related issues due to poorly designed workstations and tasks in automotive manufacturing industry (Karhu, Kansi, &Kuorinka, 2021).
- The lack of comprehensive evidence on the effectiveness of ergonomic interventions at The automotive plant South Africa's Durban plant have impacted employee productivity, injury rates, absenteeism and overall job satisfaction (The automotive plant South Africa,2023).

This research is crucial for understanding the broader implications of ergonomics in enhancing both worker health and operational efficiency in South Africa's manufacturing industry (Buss, 2021; Zohar & Luria, 2019).

1.3 Significance of the study

The significance of this study lies on its prospective to provide valuable insights into the role ergonomics interventions in improving employee well-being and enhancing productivity within the automotive manufacturing industry, in relations to The automotive plant South Africa's Durban Plant. As the manufacturing sector in South Africa faces increasing pressure to improve operational efficiency while ensuring worker safety and health, understanding the impact of ergonomics becomes crucial for both employers and employees. This study will contribute to the growing body of knowledge regarding the relationship between ergonomic practices and MSDs in manufacturing environments by evaluating the effects of ergonomic interventions at The automotive plant Durban plan, the study will provide substantial evidence on how ergonomic improvements can reduce injury rates, particularly in high risk tasks such as assembly line work. This is important not only for The automotive plant but also for other manufacturing companies seeking effective solutions to address workplace injuries, absenteeism, and long term health problems related to physical strain (karhu, Kansi,& Kuorinka, 2021).

2. Literature Review

2.1Introduction to Ergonomics and Employee Health

Ergonomics is the science of redesigning workspaces, tools, and tasks to fit the capabilities and limitations of workers (Dul & Neumann, 2009). Ergonomics plays a crucial role in improving worker health, reducing injury rates, and increasing overall productivity in the workplace, specifically in high-risk environments such as manufacturing. In the South African manufacturing sector, ergonomics has been identified as a key factor in improving workplace safety and enhancing employee performance (Visser & Muller, 2015). Ergonomics focuses on optimizing the physical demands placed on workers, ensuring that the design of tools, tasks, and work environments align with human capabilities and limitations (Karwowski, 2021).

2.2 Ergonomics and Workplace Productivity

One of the most important benefits of ergonomics is the positive impact on worker productivity. According to Kemp & Hattingh (2017), ergonomic interventions, such as redesigning workstations, appropriate seating, and using assistive devices, have been shown to reduce physical strain, minimize injuries, and enable workers to complete tasks more efficiently. These improvements result in increased production rates and reduced absenteeism due to illness or injury. In a study of South African manufacturing plants, Steyn and van Rooyen (2020) found that ergonomic programs

directly correlated with a 15% increase in overall productivity, with workers reporting fewer MSDs and higher levels of job satisfaction. Similar findings have been documented globally, where companies implementing comprehensive ergonomic strategies experienced significant improvements in employee output and quality of work (Smith & O Neil, 2019)

2.3 Ergonomics and Employee Satisfaction

Worker satisfaction is closely tied to ergonomic practices in the workplace. Employees who experience physical discomfort due to poorly designed workspaces are more likely to suffer from job dissatisfaction and burnout, which can ultimately affect retention rates. According to Zain and D'sous (2018), ergonomic improvements in South African factories were directly correlated with employee satisfaction. Workers reported feeling valued and cared for, leading to a more positive work environment and greater job loyalty. Bester and Pienaar (2016) found that when employees are provided with ergonomic tools, training, they feel more empowered and capable in their roles, which then translates into improved job performance and retention. This suggests that ergonomic improvements can help address the high turnover rate often seen in South African manufacturing sectors, particularly in physically demanding roles.

2.4 Economic and Financial Implications of Ergonomics

Ergonomics in South Africa's manufacturing sector is also increasingly viewed as a strategic financial investment. According to Naidoo (2019), poor ergonomic practices in the workplace can lead to long-term financial losses, including increased healthcare and insurance costs, absenteeism, and decreased productivity. In comparison, organizations that invest in ergonomic improvements often experience better financial performance. The initial costs of implementing ergonomic interventions are frequently offset by reductions in workplace injuries, which result in lower medical and workers' compensation claims (Bester & Pienaar, 2016).

3. Research Methodology

The study employs a mixed-methods approach, combining quantitative methods such as surveys, injury reports, productivity metrics and qualitative through interviews, observational studies data collection techniques. This approach ensures a comprehensive analysis of how ergonomic changes affect employee performance, health and overall productivity.

3.1 Research Design

The study adopts a quantitative approach. Structured surveys were distributed among employees to assess their perceptions of ergonomic improvements, work related discomfort, and job satisfaction. The surveys included Likert-scale, multiple-choice and open ended questions

3.2 Population and Sampling of the study

The study employs a stratified random sampling method to ensure a representative selection of employees across different roles and departments within The automotive plant South Africa's Durban assembly plant. This approach allows for a more comprehensive understanding of the impact of ergonomic interventions on various worker groups, including production-line employees, supervisors and occupational health specialists.

3.3 Sampling Technique

A stratified random sampling approach is used to divide employees into subgroups (strata) based on job roles and select participants randomly from each group, as indicated in Table 1. This ensures balanced representation across different categories of workers.

Table 1. Strata and sample distribution

Employee category	**Population size**	**Sample size (n)**	**Sampling technique**
Production-line workers	1200	150	Random selection from different workstations
Supervisors and team leaders	200	**30**	Random selection across departments
Health and Safety	**50**	**20**	**Purposive sampling due to specialized roles**
Total	**1450**	**200**	**Stratified random sampling**

The sampling size (n=200) is chosen to balance statistical reliability with feasibility in terms of time and resource constraints. The sample size is derived from previous studies in ergonomics research and workplace health (Lehtola et al., 2022; Cohen, 2000), ensuring statistical significance while maintaining practical data collection limits. A sample of 200 employees allows for a 95% confidence level and margin of error of approximately 5% ensuring reliability in findings.

4. Results

Figure 1 Displays the injury Rate Before and after ergonomic interventions, which shows a decline from 30-20 per 100 employees after ergonomic changes.

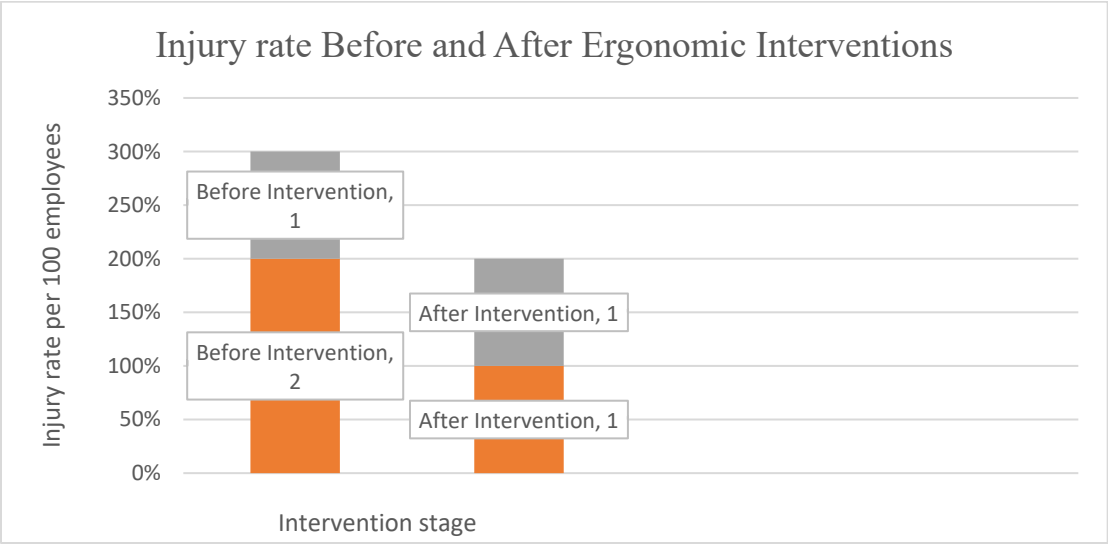

Figure 1. Injury rate.

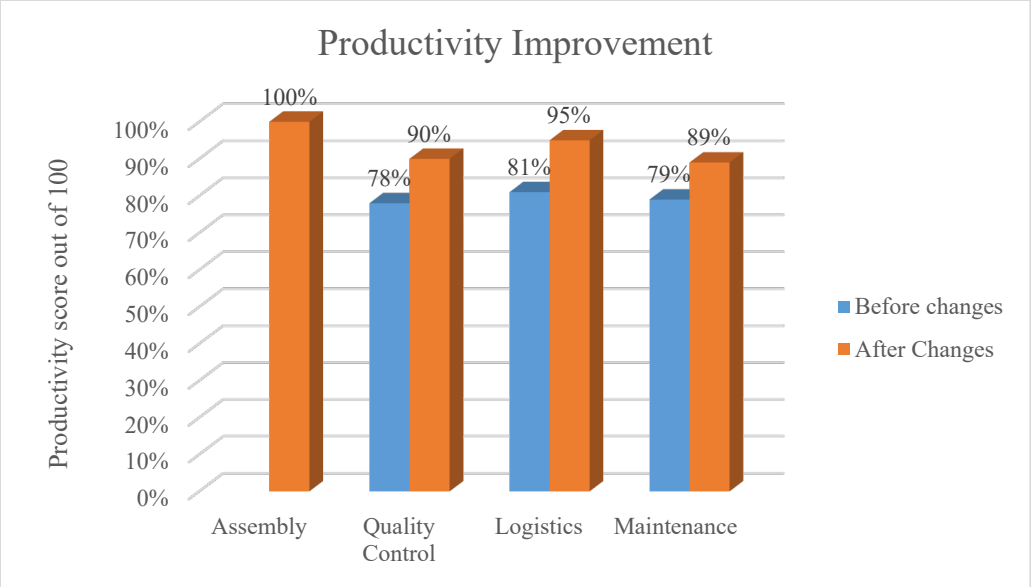

Figure 2. Productivity Improvement

Figure 2 shows productivity Improvement Post- Intervention displays an average of 9% increase in productivity across departments with assembly improving the most

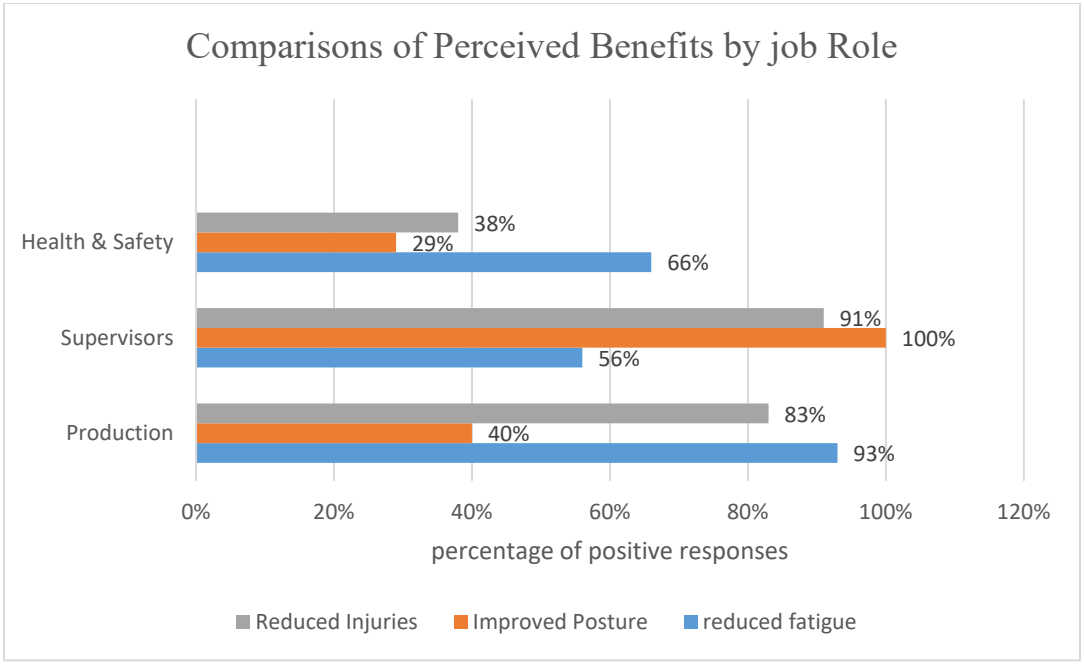

Figure 3. Perceived benefits

Figure 3 highlights that health & safety officers reported the highest benefits followed by production workers and supervisors.

5. Discussion and Conclusion

In summary, the importance of this study lies in its ability to contribute improvement of worker health safety and productivity within the automotive manufacturing sector. The findings will provide actionable insights for The

automotive plant South Africa and other manufacturing companies, likely leading to more effective ergonomic practices and safer, productive work environment. In addition, the research will fill a critical gap in the academic literature, supporting further investigations into the impact of ergonomics in South African manufacturing context.
The literature also suggests that ergonomic interventions in South Africa's manufacturing sector have a profound impact on employee performance, health, and productivity. While the initial cost of implementing ergonomic programs may be significant the long term benefits such as reduced injury rates, improved, improved productivity, and financial savings make it a worthwhile investment. However, challenges such as financial constraints, lack of expertise, and low awareness continue to hinder widespread implementation. To address these barriers, it crucial that both public and private sectors invest in ergonomic training, resources, and support to minimize the working conditions and performance of employees in the manufacturing industry.

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