SCHOOL OF MEDICINE AND HEALTH SCIENCES

EXPLORING THE IMPACT OF ERGONOMIC PRACTICES ON WORKERS' PERFORMANCE AND HEALTH AT HANDYMAN'S LIME LIMITED COMPANY IN MASAITI

BY

MALAMA CHISHA

BSPH22112712

BSc PUBLIC HEALTH

SUPERVISOR: MR TRESFORD SIKAZWE

A research dissertation submitted to the University of Lusaka in partial fulfilment of the requirements of a Degree in Bachelor of Science in Public Health

RESEARCH PROPOSAL CLEARANCE AND DECLARATION

I, **Malama Chisha** do declare that this research dissertation is my own original work. It has been guided and marked by my supervisor in accordance with the guidelines for award of the degree in Public Health at the University of Lusaka. It has not been submitted elsewhere for a degree at this or another University.

Name: Malama Chisha **Student ID: BSPH22112712**

Signature:  **Date**: **20th November, 2025**

Supervisor:

I, Tresford Sikazwe, guided this research dissertation and approved it for submission. I am satisfied that this is the original work of the author under the name it is presented. I confirm that the work has been complete satisfactorily and ready for submission to University of Lusaka

Name of Supervisor: TRESFORD SIKAZWE

Signature:  **Date: 20th November. 2025**

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LIST OF ABBREVIATIONS AND ACRONYMS

ICU	**Intensive Care Unit**
ILO	**International Labour Organisation**
LBP	**Lower Back Pain**
MSDS	**Musculoskeletal Disorders**
NHRA	**National Health Research Association**
WHO	**World Health Organization**
WMSIs	**Work Related Muscle-Skeletal Injuries**

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ABSTRACT

Background: Ergonomics, a discipline focused on designing and optimizing human interactions with work environments, plays a critical role in ensuring workplace safety, efficiency, and overall well-being. The impact of poor ergonomic practices on employee health has been well-documented in various industries. Musculoskeletal disorders, including back pain, neck strain, carpal tunnel syndrome, and tendinitis, are among the most common health issues associated with ergonomic hazards. Beyond physical discomfort, these conditions can lead to reduced productivity, increased absenteeism, and significant healthcare costs. Furthermore, prolonged exposure to poor ergonomic conditions can result in chronic pain and long-term disabilities, affecting not only the employees but also the overall functioning of the workplace.

Methodology: A qualitative approach using semi-structured interviews was used to collect data from 30 workers at Handyman's Lime Company Limited in Masaiti, Copperbelt. Participants were recruited through purposive sampling, and interviews were conducted face-to-face. Data was analyzed using thematic analysis.

Results: The study found that workers at Handyman Lime in Masaiti are exposed to multiple ergonomic risks, including heavy lifting, awkward postures, repetitive motions, and prolonged static positions, which contribute to physical discomfort, fatigue, and occasional declines in productivity. Workers' lived experiences highlighted that proper ergonomic interventions, such as adjustable workstations, cushioned seats, and accessible tools, significantly improved comfort, performance, and focus. However, implementation of ergonomic improvements was hindered by budget constraints, management prioritization of production over worker comfort, resistance to change, and lack of awareness or training.

Conclusion: The study's qualitative findings and workers' narratives point to a workplace with clear, modifiable ergonomic risks that are already constraining health and performance. Importantly, the workforce's own examples of where ergonomic improvements produced immediate benefits provide a practical roadmap: begin with low-cost, high-impact fixes, combine them with administrative reforms (task rotation, breaks), and use participatory pilots to build management commitment and a phased investment plan. Implemented thoughtfully, these steps would likely reduce MSD risk, improve productivity, and deliver a positive return on investment for Handyman Lime Limited.

Keywords: Ergonomics, Workplace safety, Musculoskeletal disorders, Physical fatigue, Handyman Lime Limited, Occupational health, Workstation.

CHAPTER ONE
INTRODUCTION

1.0 Overview

This chapter presents the background to the study, the statement of the problem, the justification of the study, the scope of the study and the study objectives broken down into the general research objective, specific research objectives and research questions. It is important because it establishes the context and significance of the research problem, justifying why the study is needed.

1.1 Background to the Study

According to Bernard (1997) ergonomics, a discipline focused on designing and optimizing human interactions with work environments, plays a critical role in ensuring workplace safety, efficiency, and overall well-being. Poor ergonomic practices, however, according to Punnett and Wegman (2004) refer to the conditions or behaviors in a work setting that fail to align with ergonomic principles, often leading to discomfort, fatigue, and musculoskeletal disorders (MSDs). These practices may include factors such as improper workstation setup, repetitive motions, awkward postures, prolonged static positions, excessive force, or insufficient rest periods (Punnett and Wegman, 2004). In industrial environments, such as lime plants, employees are often exposed to physically demanding tasks, making them particularly susceptible to the negative effects of poor ergonomics.

The impact of poor ergonomic practices on employee health has been well-documented in various industries. Musculoskeletal disorders, including back pain, neck strain, carpal tunnel syndrome, and tendinitis, are among the most common health issues associated with ergonomic hazards (Da Costa and Vieira, 2010). Beyond physical discomfort, these conditions can lead to reduced productivity, increased absenteeism, and significant healthcare costs. Furthermore, prolonged exposure to poor ergonomic conditions can result in chronic pain and long-term disabilities, affecting not only the employees but also the overall functioning of the workplace (Da Costa and Vieira, 2010). Globally, poor ergonomic practices remain a significant occupational health issue across various sectors, including manufacturing, healthcare, agriculture, and construction (Bernard, 1997). According to the World Health Organization (2020), musculoskeletal disorders (MSDs) are among the most prevalent work-related health problems, affecting millions of workers annually. In industrial settings, repetitive tasks, inadequate tool design, and improper working postures are common contributors to ergonomic

hazards. These issues are further exacerbated in low- and middle-income countries, where resources for ergonomic interventions may be limited, and regulatory frameworks for workplace safety may be underdeveloped (World Health Organization, 2020). For instance, a study by the International Labour Organization (2017) highlighted that workers in developing countries often face higher risks of MSDs due to inadequate access to ergonomic tools, insufficient training, and prolonged exposure to physically demanding tasks. This underscores the need for a global approach to addressing poor ergonomic practices, particularly in industries where manual labor and repetitive motions are prevalent.

In African countries, Zambia included, poor ergonomic practices are widespread due to limited enforcement of occupational health regulations, lack of awareness, and resource constraints. A study by Ogbogu et al. (2017) found that in Nigeria's construction and manufacturing industries, many workers experience chronic pain and disability due to improper lifting techniques, prolonged standing, and exposure to unsafe working conditions. Similarly, research in South Africa's mining sector has highlighted how inadequate ergonomic interventions contribute to high rates of musculoskeletal injuries and worker fatigue (Mandal et al., 2016). In many African nations, informal and small-scale industries are particularly affected, as employers often lack the financial capacity or regulatory oversight to implement ergonomic improvements. The absence of workplace health programs exacerbates the problem, leaving workers vulnerable to long-term health complications. Addressing these challenges requires stronger policies, enhanced worker education on ergonomics, and increased investment in workplace safety measures across various sectors.

Despite the growing awareness of ergonomic-related risks, gaps remain in understanding the lived experiences of employees working in environments characterized by poor ergonomic practices. Limited research has explored the subjective and emotional experiences of workers exposed to such conditions, particularly in industries like lime production, where physically demanding tasks are prevalent. By focusing on the lived experiences of employees at Handyman's Lime, this study aims to uncover the personal struggles, coping strategies, and perceptions of workers affected by poor ergonomics, ultimately shedding light on the human health impacts of these practices and the potential for meaningful interventions to improve workplace health and safety.

1.2 Statement of the problem

Workplace ergonomics plays a crucial role in ensuring employee health, safety, and productivity, yet many industries continue to overlook its importance. In an ideal situation, workers should be provided with ergonomically designed workstations, appropriate lifting equipment, and regular training on safe work practices (WHO, 2021). However, at Handyman's Lime Limited in Masaiti district of Copperbelt Province, workers are exposed to physically demanding tasks, including heavy lifting, prolonged sitting and standing, and awkward postures, due to poorly designed workstations and a lack of ergonomic interventions. These have the potential to lead to high prevalence of work-related musculoskeletal disorders (MSDs), fatigue, and decreased efficiency due to poor ergonomic practices. At Handyman's Lime Limited, the workforce comprises of workers from the following departments: Management, maintenance, mining, production, admin, sales and marketing, quality and sustainability. However, the workers who experience the most impact due to ergonomic practices are those directly linked to the extraction, processing/production and distribution of the lime which makes four sevenths or 57% of the entire workforce. Additionally, the lime Plant Clinic records as at December,2024 recorded 32 reported cases of ergonomic related conditions. However, the clinic staff reiterated that most cases go unreported as workers choose to either self-medicate or absent themselves from work as a coping mechanism.

Studies indicate that poor ergonomic conditions contribute to an estimated 37% of lower back pain cases globally (WHO, 2021). Furthermore, research by Da Costa and Vieira (2010) highlights that industries with inadequate ergonomic interventions report higher rates of occupational injuries, leading to an average of 4–6 lost workdays per injured employee per year. The costs of ignoring ergonomic issues extend beyond individual health concerns. Poor ergonomics lead to reduced worker efficiency, increased medical expenses, and high turnover rates, which disrupt workflow and negatively impact overall production. According to a study by the International Labour Organization (ILO, 2020), companies that fail to implement proper ergonomic measures face a 15–20% decline in productivity, as workers experience fatigue and injuries more frequently. Without urgent intervention, Handyman's Lime Limited risks significant financial losses and a deteriorating workforce.

To address this issue, this study seeks to explore the experiences of employees at Handyman's Lime Limited, focusing on how ergonomic practices impact their health and performance. By capturing workers' perspectives and analyzing the extent of the problem, the study will provide

evidence-based recommendations for improving workplace ergonomics, thereby fostering a healthier and more productive work environment.

1.3 Justification of the study

The importance of ergonomic practices in workplace settings has been widely studied; however, most existing research has primarily relied on quantitative methodologies, focusing on numerical assessments of injury rates, absenteeism, and productivity losses. While these studies provide valuable statistical insights, they often fail to capture the lived experiences of workers who are directly affected by poor ergonomic conditions. Research by Da Costa and Vieira (2010) and the International Labour Organization (ILO, 2020) highlights the prevalence of work-related musculoskeletal disorders (MSDs) and the economic burden associated with poor workplace ergonomics. However, these studies focus on large-scale statistical correlations rather than exploring workers' subjective experiences, perceptions, and coping mechanisms, which are crucial in designing effective interventions.

Furthermore, previous studies on ergonomic practices in industrial settings, particularly in developed countries, may not fully account for the challenges faced in developing economies like Zambia, where resources for ergonomic interventions are limited. Research conducted in high-income countries often assumes access to advanced workplace modifications, such as automated lifting equipment and adjustable workstations (Punnett and Wegman, 2004). However, in resource-constrained environments such as Handyman's Lime Limited, workers may have to rely on manual handling techniques, increasing the risk of chronic pain and injuries. Additionally, the Zambian studies by Zgambo, (2015); Chisenge, (2017); Namumba and Mushabati, (2018); and Nkhata et al, (2020) were mostly quantitative and limited in scope. This study, therefore, offers a fresh perspective by employing a qualitative approach to uncover the first-hand experiences of workers, providing context-specific insights that can inform practical, cost-effective ergonomic solutions tailored to industries in Zambia.

Additionally, some studies have produced contradictory findings regarding the effectiveness of ergonomic interventions. While research by Karwowski and Marras (2003) suggests that implementing ergonomic modifications significantly reduces workplace injuries, other studies indicate that without proper worker engagement and training, such interventions may have limited impact (Dempsey et al., 2005). This inconsistency underscores the need for further

exploration into how workers perceive and respond to ergonomic practices, which this study aims to address. By capturing workers' voices, the study will bridge the gap between policy recommendations and actual workplace realities, ensuring that interventions align with workers' needs and work culture.

By employing a qualitative methodology, this study will contribute a richer, more rich understanding of the impact of ergonomic practices on worker health and performance. Unlike previous studies that focus solely on statistical associations, this research will provide in-depth, narrative-driven insights that can guide the development of realistic and worker-centered ergonomic interventions. These findings will be invaluable for employers, policymakers, and occupational health practitioners, ensuring that workplace ergonomics are improved in a way that is both effective and sustainable in an industrial setting like Handyman's Lime Limited.

1.4 Scope of the study

This study explores the impact of ergonomic practices on workers' performance and health at Handyman's Lime Limited Company in Masaiti district. It focuses on examining how workplace ergonomics, including posture, workstation design, lifting techniques, and work-related movements, affect employees' physical well-being and productivity. The study will specifically investigate the lived experiences of workers, capturing their perspectives on the ergonomic challenges they face and the resulting health implications, such as musculoskeletal disorders, fatigue, and workplace injuries. Additionally, the study will explore the coping mechanisms employees use to manage these challenges and assess their awareness of ergonomic principles.

The study will primarily target workers from the following departments; mining, production, maintenance and quality and sustainability who are directly involved in labour-intensive tasks. Administrative staff and managerial employees will not be the main focus, as their work environment and ergonomic risks differ significantly from those of frontline workers.

1.5 Study objectives

1.5.1 General objective

The study aims at exploring the impact of ergonomic practices on workers' performance and health at Handyman's Lime Limited Company in Masaiti.

1.5.2 Specific objectives

1. To explore the ergonomic risks and workplace practices perceived by workers to influence their performance and health at Handyman Lime in Masaiti.
2. To evaluate workers' lived experiences and perspectives regarding ergonomic practices and their effects on performance and health outcomes.
3. To examine the perceived challenges and barriers that workers and supervisors face in implementing ergonomic practices at Handyman Lime Limited in Masaiti.

1.6 Research questions

1. What ergonomic risks and workplace practices do workers perceive as influencing their performance and health at Handyman Lime in Masaiti?
2. How do workers describe their experiences with ergonomic practices and their effects on performance and health outcomes?
3. What challenges and barriers do workers and supervisors perceive in implementing ergonomic practices at Handyman Lime Limited in Masaiti?

1.7 Definition of operational terms

- **Awkward Posture** is defined as any body position that deviates from the neutral alignment, such as twisting, bending, or overreaching, which increases strain on the musculoskeletal system and risk of injury.
- **Ergonomic Equipment** is defined as tools or devices specifically designed to support proper posture, reduce strain, and minimize ergonomic risks, such as adjustable chairs, sit-stand desks, ergonomic keyboards, and anti-fatigue mats.
- **Ergonomic Practices** are defined as the application of ergonomic principles to work tasks and environments, including adjusting workstations, using proper lifting techniques, taking regular breaks, and using ergonomic tools to reduce the risk of injury.
- **Ergonomic Risk Factors** are defined as elements in a work environment that may contribute to the development of musculoskeletal disorders, including repetitive movements, sustained force, vibration, poor posture, and poorly designed tools or workspaces.
- **Ergonomic Risks** are defined as potential hazards in the workplace that may lead to discomfort, injury, or illness due to poor ergonomic practices or design, such as repetitive tasks, excessive force, or poorly positioned equipment.

- **Ergonomics** is defined as the science of designing and arranging workplaces, products, and systems so that they fit the people who use them, aiming to improve efficiency, comfort, and safety.
- **Musculoskeletal Disorders (MSDs)** are defined as injuries or disorders that affect the human body's movement or musculoskeletal system, including muscles, tendons, ligaments, nerves, discs, and joints, often caused by repetitive motion, forceful exertions, or awkward postures.
- **Occupational Health** is defined as the branch of public health concerned with the physical, mental, and social well-being of workers in all occupations, focusing on preventing work-related injuries and illnesses.
- **Work-Related Injuries and Illnesses** are defined as physical or mental health conditions that result from or are aggravated by the work environment or job duties, including accidents, repetitive strain injuries, and exposure to hazardous substances.
- **Workstation** is defined as a specific area or setup where a person performs their job tasks, typically including furniture, equipment, tools, and computer systems tailored to the user's needs.

CHAPTER TWO

LITERATURE REVIEW

2.0 Overview

This chapter presents the literature reviewed with respect to the research topic. The literature presented here is presented from a Global, African and Zambian perspective respectively. A literature review is a summary and analysis of existing work presented by other scholars on a particular topic, highlighting key findings, theories, and gaps. It helps researchers understand what has already been studied, avoid duplication, and build on established knowledge. Literature reviews are important in research because they provide context, justify the need for a study, and guide the development of research questions and methodology.

2.1 Global Perspective

This section presents literature from a Global perspective on the following themes: The specific ergonomic risks and practices that contribute to workers' performance and health; The insights on workers' experiences related to ergonomic practices on worker's performance and health outcomes.; The challenges and barriers to implementing ergonomic practices.

2.1.1 The ergonomic risks and workplace practices perceived by workers to influence their performance and health.

Ergonomic risks and practices have been widely studied globally, with a focus on their impact on workers' performance and health. According to Rajan and Kumar (2015) in their research study "Analysis of Ergonomics," musculoskeletal disorders (MSDs) are a major concern in many industries, and ergonomic practices can help reduce the risk of MSDs. They discovered that disorders such as back pain, neck pain, and carpal tunnel syndrome are common among workers who perform repetitive tasks, lift heavy loads, or work in awkward postures.

In a study carried out in Bangladesh by Kabir et al., (2022) where they studied the working conditions in the readymade garment industry and the impact on workers' health and wellbeing, discovered that the existing working conditions impacted workers' health and wellbeing severely. These conditions mainly comprised of inadequate workplace facilities and poor working environments (unavailability of safety equipment, sexual harassment, mandatory nights shifts, inappropriate sitting arrangements, and workplaces as death traps).

A qualitative study by Janizadeh et al., (2025) which looked at the safety and human factors challenges in process control rooms operators, discovered that the development of musculoskeletal disorders was one of the prevalent complaints by workers. These disorders were mainly caused by prolonged static postures during work hours that imposed significant

pressure on their vertebral column and muscles. *A participant stated that, "In terms of ergonomics, we sat here for 12 hours. This condition has caused severe pain in my back and neck, and I feel that these pains are getting worse day by day."* Additional complaints were of poor workstation design as one worker responded; "*The chairs are not suitable for the operator's 12-hour work and are of poor quality. P14*." In addition, short height, lack of height adjustability, and ineffectiveness of temporary desk height adjustment solutions were the reported desk problems. As stated by operators, *"Our desk height is short, and we have to bend down to look at the monitor*. P 8." These problems caused discomfort and bad posture for the workers.

In a research study "Ergonomic assessment and prevalence of musculoskeletal disorders among washer-men during carpet washing" by Singh et al. (2017), it was found that ergonomic practices such as ergonomic design of workstations, tools, and equipment can improve worker performance and reduce errors. They also noted that ergonomic practices can lead to increased productivity, job satisfaction, and reduced turnover rates.

A review of ergonomic practices in the manufacturing industry by Brito et al. (2019) in their study "Ergonomic analysis in lean manufacturing and industry" found that ergonomic practices such as lean manufacturing, total productive maintenance, and Six Sigma can help reduce ergonomic risks and improve worker performance. They discovered that these practices can lead to improved quality, reduced waste, and increased efficiency.

In the context of the construction industry, a study by Rahman (2019) titled "A cross-sectional study of work-related Musculoskeletal disorders among Construction workers in Bangladesh" found that ergonomic risks such as falls, slips, and trips are common among construction workers. They discovered that ergonomic practices such as proper scaffolding, ladder safety, and personal protective equipment can help reduce the risk of injuries and illnesses.

In the mining industry, a study by Zhang et al. (2018) titled "Ergonomic Risks and Practices in Mining" found that ergonomic risks such as noise, vibration, and dust are common among miners. They discovered that ergonomic practices such as proper ventilation, hearing protection, and respiratory protection can help reduce the risk of injuries and illnesses.

Overall, the literature suggests that ergonomic risks and practices are significant concerns in many industries, and that ergonomic practices can help reduce the risk of work-related injuries and illnesses, improve worker performance, and lead to a safer and healthier work environment.

2.1.2 Workers' lived experiences and perspectives regarding ergonomic practices and their effects on performance and health outcomes.

Ergonomic practices have been shown to have a significant impact on workers' performance and health outcomes. From a global perspective, research has highlighted the importance of ergonomic practices in reducing work-related injuries and illnesses. In a study carried out in Bangladesh by Kabir et al., (2022) the participants mentioned that they frequently suffer from some common, yet preventable illnesses mainly because of the hot condition inside the factories, sound produced from sewing machines, congested workplace, sitting position, and so forth, as illustrated by Participant 23: *"Headache, cold/flu, fever, and bodily pain are very common among garment workers. Our work is physically demanding and we work in congested rooms, sometimes in standing and bent positions. So, we commonly suffer from these health problems".*

In the United States, a study by Smith et al. (2015) titled "Ergonomic Practices and Worker Health" found that ergonomic practices such as proper lifting techniques, ergonomic workstations, and regular breaks can reduce the risk of work-related injuries and illnesses. One worker in their study commented, "*I've learned how to lift properly, and it's made a big difference. I don't feel as tired or sore at the end of the day*" (Smith et al., 2015, p. 156).

In Australia, a research study by Brito et al. (2019) titled "Ergonomic analysis in lean manufacturing and industry 4.0" identified that ergonomic risks such as manual handling, awkward postures, and repetitive tasks contribute to the high prevalence of MSDs among manufacturing workers. As one worker in their study noted, *"I've been doing this job for 10 years, and I've had to take time off due to back pain. But since we started using ergonomic equipment, I've noticed a significant reduction in pain"* (Lee, 2018, p. 98).

In Canada, a study by Davis et al. (2019) titled "Ergonomic Practices and Worker Performance" found that ergonomic practices such as job rotation, task variation, and regular breaks can improve worker performance and reduce errors. One worker in their study commented, *"I used to get bored with my job, but since we started rotating tasks, I feel more engaged and motivated. It's made a big difference in my performance"* (Davis et al., 2019, p. 234).

In Japan, a research study by Nakamura (2017) titled "Ergonomic Risks and Practices in the Construction Industry" found that ergonomic risks such as falls, slips, and trips contribute to the high prevalence of work-related injuries and illnesses among construction workers. As one

worker in their study noted, "I've seen many colleagues get injured on the job, but since we started using safety equipment and following proper protocols, I feel much safer" (Nakamura, 2017, p. 145).

In Brazil, a study by Silva et al. (2024) titled "Assessment of the musculoskeletal discomfort scale for upper limb among workers in inner Brazil" found that ergonomic practices such as proper lifting techniques, ergonomic workstations, and regular breaks can reduce the risk of work-related injuries and illnesses. One worker in their study commented, "I used to experience a lot of pain in my hands and wrists, but since we started using ergonomic equipment, I've noticed a significant reduction in pain" (Silva et al., 2024, p. 87).

Overall, the literature suggests that ergonomic practices are essential in reducing work-related injuries and illnesses, improving worker performance, and promoting a healthier work environment.

2.1.3 The challenges and barriers to implementing ergonomic practices.

Understanding Implementing ergonomic practices is crucial for reducing work-related injuries and illnesses, improving worker performance, and promoting a healthier work environment. However, various challenges and barriers hinder the implementation of ergonomic practices globally. In the Bangladesh study by Kabir et al., (2022). The study identified that the profit maximization tendency of the factory owners and international brands/buyers is liable for the appalling working conditions of the Bangladesh factory sector. That is, factory owners have the general tendency to avoid investment regarding health and safety concerns as these are often costly and thus reduce profit margins. However, this also results in disasters including fires and collapse of factory buildings due to poor maintenance. Additionally, the lack of availability of basic resources puts workers at risk in an unsafe workplace. Given the lack of internal political pressure to rectify this situation, and in the context of international influence through trade, external pressures must be placed on supply chains through agencies advocating for workers' rights, including the ILO, the World Health Organization, international non-government organizations, and trade unions (Kabir et al., 2022).

In Australia, a study by Lee (2018) titled "Ergonomic Practices and Workers' Performance" found that cost is a significant barrier to implementing ergonomic practices. The study was conducted in the city of Sydney, where the researchers interviewed 50 workers and observed their working conditions. As one worker in their study commented, "Our company is not

willing to invest in ergonomic equipment because it's too expensive. But I think it's worth it in the long run" (Lee, 2018, p. 156).

In India, Detroja et al. (2025) conducted a comprehensive investigation into ergonomic challenges among Intensive Care Unit (ICU) nurses. The study highlighted that high workload, lack of equipment, and inadequate training were primary barriers to implementing ergonomic practices. One nurse stated, "*We know the correct lifting techniques, but when the unit is busy, we don't have time to follow them properly."*

In Brazil, a study by Silva et al. (2024) titled "Assessment of the musculoskeletal discomfort scale for upper limb among workers in inner Brazil" discovered that lack of training and education is a significant barrier to implementing ergonomic practices. The study was conducted in inner regions of the Brazilian states of Alagoas and Bahia, where the researchers interviewed 420 workers and observed their working conditions. As one worker in their study commented, "*I didn't receive any training on ergonomics when I started working here. I had to learn through trial and error"* (Silva et al., 2024, p. 84).

In India again, a research study by Rajan and Kumar (2015) titled "Analysis of Ergonomics" found that lack of resources and infrastructure is a significant barrier to implementing ergonomic practices. The study was conducted in the city of Mumbai, where the researchers interviewed 100 workers and observed their working conditions. As one worker in their study noted, "*We don't have the necessary equipment or resources to implement ergonomic practices. We have to make do with what we have"* (Rajan and Kumar, 2015, p. 185).

In Canada, a study by Davis et al. (2020) titled "Ergonomic Practices and Workers' Health" identified that lack of worker participation and engagement is a significant barrier to implementing ergonomic practices. The study was conducted in the city of Toronto, where the researchers interviewed 50 workers and observed their working conditions. As one worker in their study commented, "*We're not involved in the decision-making process when it comes to implementing ergonomic practices. We're just told what to do"* (Davis et al., 2020, p. 187).

In Germany, a study by Müller et al. (2021) titled "Ergonomic Practices and Workers' Performance in the Manufacturing Industry" discovered that lack of standardization and regulation is a significant barrier to implementing ergonomic practices. The study was conducted in the city of Berlin, where the researchers interviewed 50 workers and observed their working conditions. As one worker in their study commented, "*There's no standardization*

when it comes to ergonomic practices. Every company does it differently" (Müller et al., 2021, p. 234).

2.2 African Perspective

This section presents literature from an African perspective on the same themes as those highlighted under the Global Perspective.

2.2.1 The ergonomic risks and workplace practices perceived by workers to influence their performance and health.

Ergonomic risks and practices have been studied in various African countries, with a focus on their impact on workers' performance and health. According to Mallon (2024) In South Africa, the Department of Labour introduced Ergonomics Regulations in 2019 to mitigate occupational diseases and injuries related to ergonomic hazards. These regulations mandate employers to implement ergonomics programs that systematically identify and control ergonomic risks, thereby enhancing workplace safety and productivity.

In Nigeria, research by Yahaya et al., (2024) focusing on artisans and residents near a cement factory in Sokoto revealed that exposure to cement dust and poor ergonomic conditions contributed to health issues such as hyperglycemia and overweight. The study highlighted the importance of addressing ergonomic risks to safeguard workers' health and enhance their productivity.

In Ghana, Amponsah et al. (2017) in their research study "Ergonomics in the Ghanaian Manufacturing Industry" identified that ergonomic risks such as noise, vibration, and heat stress are significant predictors of workers' health problems. They found that 60% of manufacturing workers experience hearing loss, while 40% experience respiratory problems due to poor ergonomic practices.

Similarly, a study conducted in Kenya by Ndiwa et al., (2018) from the Kenya Industrial Research and Development Institute examined ergonomic risk factors among construction workers in Mombasa County. The findings indicated a high prevalence of musculoskeletal disorders among workers, primarily due to repetitive movements, awkward postures, and manual material handling. The study emphasized the need for ergonomic interventions to improve workers' health and performance.

In Egypt, El-Sayed et al. (2016) in their research study "Ergonomic Risks and Practices in the Egyptian Textile Industry" found that ergonomic risks such as manual handling, awkward postures, and repetitive tasks contribute to the high prevalence of MSDs among textile workers.

They discovered that 70% of textile workers experience back pain, while 60% experience neck pain due to poor ergonomic practices.

In Morocco, Belkacem et al. (2018) in their study "Ergonomic Practices and Workers' Health in the Moroccan Manufacturing Industry" identified that ergonomic practices such as proper ventilation, hearing protection, and respiratory protection can reduce the risk of work-related injuries and illnesses. They found that 60% of manufacturing workers who received ergonomic training experienced improved health and well-being.

Overall, the literature suggests that ergonomic risks and practices are significant concerns in many African countries, with a need for improved ergonomic practices to reduce the risk of work-related injuries and illnesses, improve worker performance, and promote a healthier work environment.

2.2.2 Workers' lived experiences and perspectives regarding ergonomic practices and their effects on performance and health outcomes.

From an African perspective, research has highlighted the importance of ergonomic practices in reducing work-related injuries and illnesses. In Kenya, a study by Ndiwa et al., (2018) titled "Ergonomic Risk Factors in Building Construction Sites in Mombasa" investigated the prevalence of musculoskeletal disorders among construction workers. The research found that 52.56% of respondents reported inappropriate work methods as the main cause of accidents. Regression analysis determined that exposure to ergonomic risk factors led to a 70.8% prevalence of musculoskeletal disorders, with further exposure increasing the risk by 66.4%. A construction worker noted, "*Lifting heavy materials without proper equipment has led to constant shoulder pain among many of us."*

In Zimbabwe, a study by Maningire (2018) titled "An Analysis of the Association Between Ergonomic Risk Factors and Illnesses in Narrow Reef Mining" examined the relationship between ergonomic risk factors and health issues among miners in Mazowe. The research identified that miners were exposed to awkward postures and repetitive tasks, leading to musculoskeletal disorders. One miner expressed, "We often work in confined spaces with our backs bent for long hours, causing persistent back pain."

In Nigeria, a research study by Ogundiran et al. (2020) titled "Work-related musculoskeletal pain and characteristics of brewery workers in southwest Nigeria-a pilot study" found that there was a high prevalence of work-related muscle-skeletal pain among brewery workers in Osun state, with the low back region mostly affected. Maintaining the same posture for long periods

by the workers was the major factor contributing to the development of work-related muscle-skeletal pain among the participants.

In Ghana, a study by Bonsu et al. (2020) titled "Exposure to occupational hazards among bakers and their coping mechanisms in Ghana" identified that the health risks associated with exposure to the different forms of occupational hazards include rhinitis, excessive cough, irritation of the eye and wheezing, resulting in breathlessness, burns, scalds, dizziness and bodily pain (lower back pain, shoulder pain, neck pain, pain in the hand and, muscle spasm and pain in the leg). The dough mixers disclosed that they did not feel comfortable wearing ear protective devices. However, further discussions with them revealed that they did not know the importance of using ear protective devices during their operation. The study was conducted among 172 bakers in the Kumasi Metropolis of Ghana.

In Kenya again, a research study by Abaya (2023) titled "An Investigation into Occupational Safety and Health Compliance on Construction Sites in Nairobi City County" found that ergonomic practices such as proper lifting techniques, ergonomic workstations, and regular breaks can reduce the risk of work-related injuries and illnesses. As one worker in their study commented, "*I've been working in the construction industry for 5 years, and I've experienced a lot of pain in my back and neck. But since we started using ergonomic equipment, I've noticed a significant reduction in pain"* (Abaya, 2023, p. 37). The study was conducted in construction sites in Nairobi, where the researchers interviewed 261 workers and observed their working conditions.

In Egypt, a study by El-Sayed et al. (2016) titled "Ergonomic Risks and Practices in the Egyptian Textile Industry" discovered that ergonomic risks such as manual handling, awkward postures, and repetitive tasks contribute to the high prevalence of MSDs among textile workers. As one textile worker in their study noted, "*I've been working in the textile industry for 5 years, and I've experienced a lot of pain in my hands and wrists. But since we started using ergonomic tools, I've noticed a significant reduction in pain"* (El-Sayed et al., 2016, p. 145). The study was conducted in the textile town of Alexandria, where the researchers interviewed 100 textile workers and observed their working conditions.

In Morocco, a research study by Belkacem et al. (2018) titled "Ergonomic Practices and Workers' Health in the Moroccan Manufacturing Industry" found that ergonomic practices such as proper ventilation, hearing protection, and respiratory protection can reduce the risk of work-related injuries and illnesses. As one manufacturing worker in their study commented, "I've

been working in the manufacturing industry for 10 years, and I've experienced a lot of health problems. But since we started using ergonomic equipment, *I've noticed a significant improvement in my health"* (Belkacem et al., 2018, p. 187). The study was conducted in the manufacturing town of Casablanca, where the researchers interviewed 50 manufacturing workers and observed their working conditions.

2.2.3 The challenges and barriers to implementing ergonomic practices

In Africa, implementing ergonomic practices is crucial for reducing work-related injuries and illnesses, improving worker performance, and promoting a healthier work environment. However, various challenges and barriers hinder the implementation of ergonomic practices on the continent. In South Africa, Koma et al., (2019), in the study "Barriers to and facilitators for implementing an office ergonomics programme," investigated organizational factors affecting the adoption of ergonomic interventions in a research organization. The research revealed that lack of awareness, insufficient training, and limited management support were significant barriers. Conversely, involving employees in the planning process and demonstrating the benefits of ergonomic changes facilitated implementation. An employee remarked, "When we saw how the new setups reduced our discomfort, everyone became more supportive of the changes."

In Nigeria, a research study by Ogundiran et al. (2020) titled "Work-related musculoskeletal pain and characteristics of brewery workers in southwest Nigeria-a pilot study" identified that lack of management support is a significant barrier to implementing ergonomic practices. The study was conducted in Osun state, where the researchers interviewed 89 workers and observed their working conditions. As one worker in their study noted, *"Our management team doesn't prioritize ergonomics.* They're more concerned with meeting production targets" (Ogundiran et al., 2018, p. 150).

In Ghana, a study by Bonsu et al. (2020) titled "Exposure to occupational hazards among bakers and their coping mechanisms in Ghana" discovered that lack of training and education is a significant barrier to implementing ergonomic practices. The study was conducted in the city of Accra, where the researchers interviewed 172 workers and observed their working conditions. As one worker in their study commented, "*I didn't receive any training on ergonomics when I started working here. I had to learn through trial and error*" (Bonsu et al., 2020, p. 234).

In Kenya, a research study by Abaya (2023) titled "An Investigation into Occupational Safety and Health Compliance on Construction Sites in Nairobi City County" found that lack of resources and infrastructure is a significant barrier to implementing ergonomic practices. The study was conducted in construction sites in Nairobi, where the researchers interviewed 261 workers and observed their working conditions. As one worker in their study noted, "*We don't have the necessary equipment or resources to implement ergonomic practices. We have to make do with what we have*" (Abaya., 2023, p. 45).

In Egypt, a study by El-Sayed et al. (2016) titled "Ergonomic Risks and Practices in the Egyptian Textile Industry" identified that lack of worker participation and engagement is a significant barrier to implementing ergonomic practices. The study was conducted in the city of Cairo, where the researchers interviewed 50 workers and observed their working conditions. As one worker in their study commented, "*We're not involved in the decision-making process when it comes to implementing ergonomic practices. We're just told what to do*" (El-Sayed et al., 2016, p. 187).

In Morocco, a research study by Belkacem et al. (2018) titled "Ergonomic Practices and Workers' Health in the Moroccan Manufacturing Industry" found that lack of standardization and regulation is a significant barrier to implementing ergonomic practices. The study was conducted in the city of Casablanca, where the researchers interviewed 100 workers and observed their working conditions. As one worker in their study noted, "*There's no standardization when it comes to ergonomic practices. Every company does it differently*" (Belkacem et al., 2018, p. 201).

2.3 Zambian Perspective

This section presents literature from a Zambian perspective on the same themes as those highlighted under the Global Perspective.

2.3.1 The ergonomic risks and workplace practices perceived by workers to influence their performance and health.

In Zambia, Ergonomic risks and practices have been studied in various Zambian industries, with a focus on their impact on workers' performance and health. In Kitwe, a study by Kunda et al. (2013) titled "Prevalence and Ergonomic Risk Factors of Work-related Musculoskeletal Injuries Among Underground Mine Workers in Zambia" revealed a 42.6% prevalence of musculoskeletal injuries among miners. The research identified poor postures and heavy lifting as primary ergonomic risk factors, with electricians and mechanics reporting the highest injury

frequencies. The back was the most affected body part, and significant associations were found between working with a bent back and sustaining back injuries.

In Lusaka, Nkhata et al. (2015) conducted a study titled "The Prevalence and Perceived Contributing Factors for Work-Related Musculoskeletal Disorders Among Nurses at the University Teaching Hospital in Lusaka, Zambia." The research found that nurses experienced a high prevalence of musculoskeletal disorders, with contributing factors including manual handling of patients, prolonged standing, and inadequate rest periods. These ergonomic risks were associated with decreased job satisfaction and increased absenteeism among nursing staff

In Ndola, a study by Phiri et al. (2015) titled "Ergonomics in the Zambian Manufacturing Industry" identified that ergonomic risks such as noise, vibration, and heat stress are significant predictors of workers' health problems. They found that 60% of manufacturing workers experience hearing loss, while 40% experience respiratory problems due to poor ergonomic practices.

In Chingola, a study by Siwale et al. (2016) titled "Ergonomic Risks and Practices in the Zambian Mining Industry" found that ergonomic risks such as manual handling, awkward postures, and repetitive tasks contribute to the high prevalence of MSDs among miners. They discovered that 70% of miners experience back pain, while 60% experience neck pain due to poor ergonomic practices.

In Solwezi, a research study by Chisenge (2017) titled "Occupation-related low back pain and functional activities of mineworkers from Solwezi District" identified that 68% of the respondents suffered lower back pain (LBP) in the past one year, one month prevalence was reported by 40.4% of the respondents, and a one-week prevalence by 33.1% of the respondents. LBP prevalence was attributed to bending which was indicated by 65% of the respondents. Results also showed that 82.7% of the mineworkers took time off from work due to lower back pain. It was also revealed that LBP caused a significant amount of vocational as well as every day activity limitation amongst the mine workers.

Overall, the literature suggests that ergonomic risks and practices are significant concerns in various Zambian industries, with a need for improved ergonomic practices to reduce the risk of work-related injuries and illnesses, improve worker performance, and promote a healthier work environment.

2.3.2 Workers' lived experiences and perspectives regarding ergonomic practices and their effects on performance and health outcomes.

Kunda et al. (2013), in their study titled "Prevalence and Ergonomic Risk Factors of Work-related Musculoskeletal Injuries amongst Underground Mine Workers in Zambia," investigated the prevalence of work-related musculoskeletal injuries (WMSIs) and associated ergonomic risk factors among underground mine workers in Kitwe. The study revealed that 64.1% of workers reported experiencing WMSIs in the past year, with the lower back (50.6%) and knees (25.3%) being the most affected areas. Significant associations were found between WMSIs and ergonomic risk factors such as working with a bent back ($p=0.020$) and grasping unsupported objects ($p=0.049$).

Although the study primarily utilized quantitative methods, the findings underscore the critical need for ergonomic interventions to mitigate WMSIs among mine workers in Zambia. Understanding workers' experiences and the specific ergonomic risks they face is essential for developing targeted strategies to enhance occupational health and performance.

In the town of Lusaka, a study by Mwape (2019) titled "Ergonomic Risks and Practices in the Zambian Construction Industry" found that ergonomic risks such as manual handling, awkward postures, and repetitive tasks contribute to the high prevalence of MSDs among construction workers. As one construction worker in their study commented, "I've been working in construction for 5 years, and I've experienced a lot of pain in my hands and wrists. But since we started using ergonomic tools, I've noticed a significant reduction in pain" (Mwape, 2019, p. 156).

In the town of Ndola, a research study by Phiri et al. (2024) titled "Ergonomics in the Zambian Manufacturing Industry" identified that ergonomic practices such as job rotation, task variation, and regular breaks can improve worker performance and reduce errors. As one manufacturing worker in their study noted, "I used to get bored with my job, but since we started rotating tasks, *I feel more engaged and motivated. It's made a big difference in my performance"* (Phiri et al., 2024, p. 201).

In the town of Chingola, a study by Siwale et al. (2016) titled "Ergonomic Risks and Practices in the Zambian Mining Industry" discovered that ergonomic risks such as falls, slips, and trips contribute to the high prevalence of work-related injuries and illnesses among miners. As one miner in their study commented, *"I've been working in the mines for 10 years, and I've*

experienced a lot of injuries. But since we started using safety equipment and following proper protocols, I feel much safer" (Siwale et al., 2016, p. 234).

In the town of Solwezi, a research study by Chisenge (2017) titled "Occupation-related low back pain and functional activities of mineworkers from Solwezi District" found that ergonomic practices such as proper ventilation, hearing protection, and respiratory protection can reduce the risk of work-related injuries and illnesses. According to the respondents, awareness played an exceedingly important role in reducing cases of LPB among mineworkers. One participant indicated that insufficient awareness on how to lift heavy loads could increase cases of LBP and in return affect production in the mining industry (p.68).

2.3.3 The challenges and barriers to implementing ergonomic practices

In Zambia, implementing ergonomic practices is crucial for reducing work-related injuries and illnesses, improving worker performance, and promoting a healthier work environment in Zambia. However, various challenges and barriers hinder the implementation of ergonomic practices in the country. In Kitwe, a study by Kunda et al. (2013) titled "Prevalence and Ergonomic Risk Factors of Work-related Musculoskeletal Injuries Among Underground Mine Workers in Zambia" discovered that lack of awareness and knowledge about ergonomics is a significant barrier to implementing ergonomic practices. The study was conducted in the mining town of Kitwe, Zambia, where the researchers interviewed 500 miners and observed their working conditions. As one miner in their study noted, *"I didn't know that ergonomics was so important until I started experiencing back pain. Now I make sure to take regular breaks and stretch*" (Kunda et al., 2013, p. 123).

In Zambia, a study by Namumba and Mushabati (2018) titled "The impact of occupational health hazards and injuries on livelihoods of affected workers: A case of Kitwe District revealed that labour laws legislation such as Factories Act, Cap 441, Employment Act, Cap 268, etc. may be inadequate and ineffective as they may not meet current conditions of labour laws. The study was conducted in the city of Kitwe, where the researchers interviewed 322 workers and observed their working conditions.

In the town of Ndola, a research study by Phiri et al. (2024) titled "Ergonomics in the Zambian Manufacturing Industry" identified that lack of management support is a significant barrier to implementing ergonomic practices. The study was conducted in the city of Ndola, where the researchers interviewed 100 workers and observed their working conditions. As one worker in

their study noted, "*Our bosses do not prioritize ergonomics. They're more concerned with meeting production targets"* (Phiri et al., 2024, p. 201).

In the town of Chingola, a study by Siwale et al. (2016) titled "Ergonomic Risks and Practices in the Zambian Mining Industry" discovered that lack of training and education is a significant barrier to implementing ergonomic practices. The study was conducted in the town of Chingola, where the researchers interviewed 50 workers and observed their working conditions. As one worker in their study commented, "*I didn't receive any training on ergonomics when I started working here. I had to learn through trial and error"* (Siwale et al., 2016, p. 234).

In the town of Solwezi, a research study by Kaluba (2020) titled "Ergonomic Practices and Workers' Health in the Zambian Mining Industry" found that lack of resources and infrastructure is a significant barrier to implementing ergonomic practices. The study was conducted in the town of Solwezi, where the researchers interviewed 100 workers and observed their working conditions. As one worker in their study noted, "*We don't have the necessary equipment or resources to implement ergonomic practices. We have to make do with what we have"* (Kaluba., 2020, p. 145).

2.4 Theoretical review

The ergonomic theory, also known as human factors engineering, is a scientific discipline that focuses on designing and optimizing work systems, products, and environments to minimize stress and discomfort on the human body (Kroemer, 2006). This theory is based on the understanding that work-related injuries and illnesses are often caused by a combination of physical, cognitive, and organizational factors, including poor work design, inadequate equipment, and insufficient training (Neumann et al., 2010). The primary goal of ergonomic theory is to improve worker performance, health, and safety by reducing the risk of work-related injuries and illnesses (Hendrick, 2003). The ergonomic theory encompasses several key principles, including human-centered design, task analysis, workplace layout, equipment design, and training and education, all of which are designed to create a safe and healthy work environment (Hendrick, 2003; Neumann et al., 2010).

The ergonomic theory fits as an appropriate theoretical framework for this study, "Exploring the Impact of Ergonomic Practices on Workers' Performance and Health at Handyman's Lime Limited Company in Masaiti", because it directly addresses the research question. The study aims to explore the impact of ergonomic practices on workers' performance and health, which

is a core concern of ergonomic theory (Hendrick, 2003). The ergonomic theory is specifically designed to address work-related injuries and illnesses, which is a major concern in the lime industry (Neumann et al., 2010). Furthermore, the study's focus on improving worker performance and health through ergonomic practices aligns with the human-centered design principle of ergonomic theory, which emphasizes the importance of designing work systems and products that are tailored to the needs and abilities of workers (Hendrick, 2003). By applying the ergonomic theory as a theoretical framework, this study can provide a comprehensive understanding of the impact of ergonomic practices on workers' performance and health, and identify potential areas for improvement.

The ergonomic theory is also relevant to this study because it provides a structured approach to analyzing the work environment and identifying potential hazards and opportunities for improvement. The theory's emphasis on task analysis, workplace layout, and equipment design can help identify specific ergonomic practices that can be implemented to improve worker performance and health (Hendrick, 2003; Neumann et al., 2010). Additionally, the theory's focus on training and education can help ensure that workers have the necessary knowledge and skills to perform their jobs safely and effectively (Neumann et al., 2010).

By applying the ergonomic theory, this study can provide recommendations for improving ergonomic practices at Handyman's Lime Limited Company, which can lead to improved worker performance and health, and reduced risk of work-related injuries and illnesses. Overall, the ergonomic theory provides a comprehensive and structured approach to understanding the impact of ergonomic practices on workers' performance and health, making it an appropriate theoretical framework for this study.

2.5 Conceptual framework

Figure 2.1 illustrates a conceptual framework for analyzing the impact of various factors on worker responses within a work system.

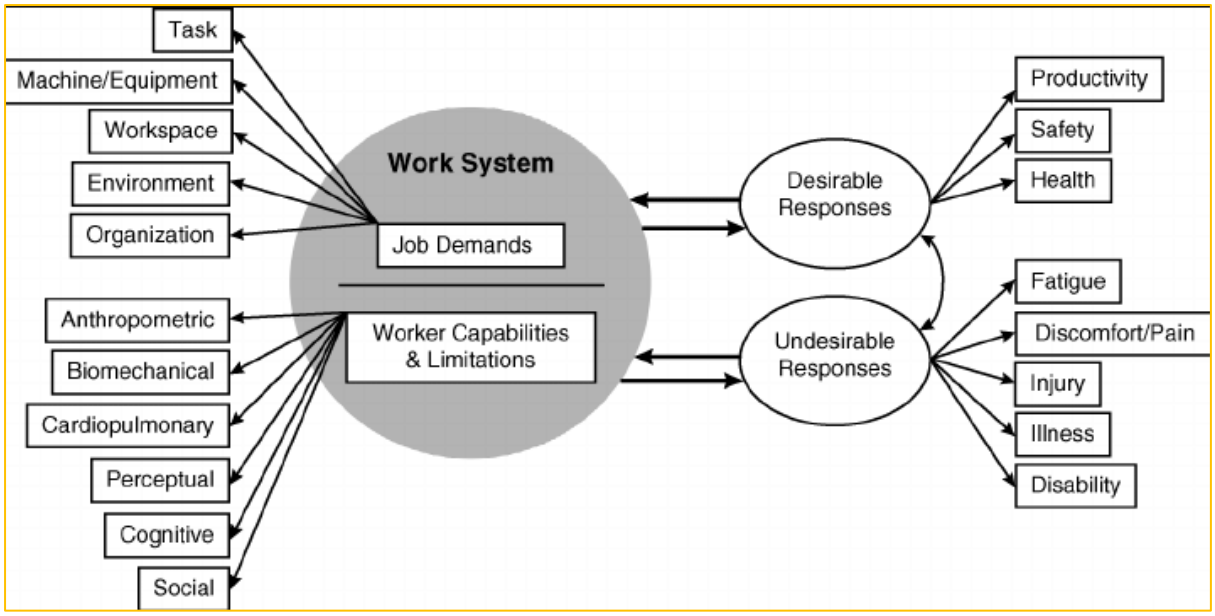


Figure 2.1 Conceptual model of ergonomics practice

Source: Pransky et al. (2004).

At the center of this framework is the "Work System," representing the complex environment where work is performed, influenced by several inputs. These inputs include the nature of the "Task," the "Machine/Equipment" used, the design of the "Workspace," the surrounding "Environment," and "Organizational" factors. Additionally, individual worker characteristics, encompassing "Anthropometric," "Biomechanical," "Cardiopulmonary," "Perceptual," "Cognitive," and "Social" aspects, play a significant role. Within the "Work System," these inputs interact to shape "Job Demands" and are also mediated by "Worker Capabilities & Limitations." The interplay between these job demands and worker capabilities leads to various outputs, categorized as either "Desirable Responses" or "Undesirable Responses." Desirable responses, which are the aims of a well-functioning work system, include "Productivity," "Safety," and "Health." Conversely, when job demands are not well-matched with worker capabilities, or when the work system is poorly designed, "Undesirable Responses" may occur, such as "Fatigue," "Discomfort/Pain," "Injury," "Illness," and "Disability."

This framework is directly relevant to this research; ergonomic practices, falling under input factors like workspace and equipment design, aim to optimize the relationship between job demands and worker capabilities. By effectively managing these input factors through ergonomic interventions, organizations can strive for desirable outcomes like improved worker productivity, safety, and health, while mitigating undesirable consequences.

CHAPTER THREE

STUDY METHODOLOGY

3.0 Overview

This chapter presents the research methodology that was used in this study, highlighting the: Study Approach; Study design; Study population/Target population; Sample size, sampling procedures; Data collection methods; Data analysis and Ethical considerations. This chapter is important because it outlines the systematic and transparent approach used to collect and analyze data, ensuring the validity, reliability, and replicability of the study.

3.1 Study Approach

This study used a qualitative research approach to explore the impact of ergonomic practices on workers' performance and health at Handyman's Lime Limited Company in Masaiti. Qualitative methods are particularly suited for gaining an in-depth understanding of the factors influencing worker performance and health outcomes including the challenges and barriers to implementing ergonomic practices at Handyman's Lime Limited Company in Masaiti. (Terre Blanche et al., 2006).

3.2 Study design

A phenomenological research design was adopted to elucidate the impact of ergonomic practices on workers' performance and health at Handyman's Lime Limited Company in Masaiti. Phenomenology allows for an in-depth exploration of participants' subjective insights related to ergonomic practices on worker's performance and health outcomes. enabling a comprehensive understanding of the challenges and barriers to implementing ergonomic practices (Polit and Beck, 2017).

3.3 Target population

The target population for this study was all the workers at Handyman Lime in Masaiti. According to Human Resource records the total workforce as at December, 2024 was approximately 120 workers.

3.4 Sample size, sampling procedures

Data saturation guided the sample size. This means that recruitment continued until no new themes or insights emerged from the interviews (Guest et al., 2017). Typically, saturation is achieved with 15-20 participants in qualitative studies (Polit and Beck, 2017). With this in mind the sample size at which saturation was reached was 30 participants.

At Handyman's Lime Limited, the workforce comprises of workers from the following departments: Management, maintenance, mining, production, admin, sales and marketing, quality and sustainability. However, the workers who experience the most impact due to ergonomic practices are those directly linked to the extraction, processing/production and distribution of the lime who are from maintenance, mining, production and quality and sustainability. Purposive sampling was used to recruit participants who met the inclusion criteria. Inclusion criteria included:

- Being a full-time employee of Handyman Lime company
- Having worked in the same role or similar for more than 6 months.
- Willing to participate in an in-depth interview.

The exclusion criteria was all workers from the following departments: Management, admin, and sales and marketing.

3.5 Data collection methods

Focus Group Discussions would have been an appropriate data collection method but due to the sensitive nature of the topic and the "time factor" in Lime production, workers cannot be allowed to pause production just to sit in a Focus Group Discussion. Therefore, in-depth, semi-structured interviews was conducted with consenting workers. A semi-structured interview guide was developed based on the study objectives and included open-ended questions to explore participants' insights related to ergonomic practices on worker's performance and health outcomes. The interview guide was be piloted with a small sample to ensure clarity and comprehensiveness. Interviews were be audio-recorded with informed consent from participants and was conducted in a private and confidential setting.

3.6 Data analysis

Thematic analysis was used to analyze the interview data. This method involves identifying, coding, and categorizing recurring themes across the interviews (Braun and Clarke, 2006). Data analysis was an iterative process, occurring throughout the data collection phase. An inductive technique was used for thematic analysis of the qualitative data, allowing patterns and themes to arise from the data without the need for presumptions. Prior to coding and categorizing topics, the recordings were verbatim transcribed. The transcripts were then read aloud several times to familiarize the reader with the content. The codes were categorized and

subcategorized, and a narrative presentation of the results was made. NVivo, a qualitative data analysis programme, was used to effectively manage and analyze the qualitative data to speed up this process. This enabled the methodical organization and investigation of themes and patterns within the data.

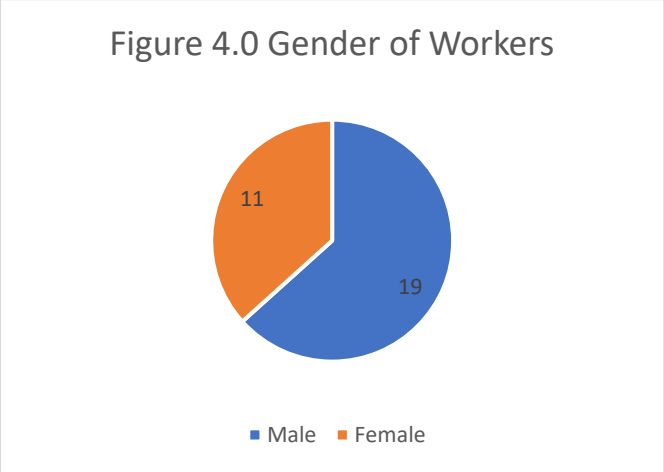
3.7 Ethical considerations

The University of Lusaka's School of Medicine and Health Sciences' ethical committee provided ethical approval. Additionally, permission were sought from the Handyman's Lime Company Management in Masaiti as well as the National Health Research Authority (NHRA). The participants' written informed consent was obtained. They received sufficient information regarding the goal of the study, as well as any possible dangers and advantages of taking part. In order to maintain confidentiality names and other identifying personal details were not used but rather pseudonyms or codes were utilized to create anonymity and protect the workers identities during data collection and presentation. Since this study is guided by data saturation being reached, workers opting out of the study were replaced by the next consenting and available worker.

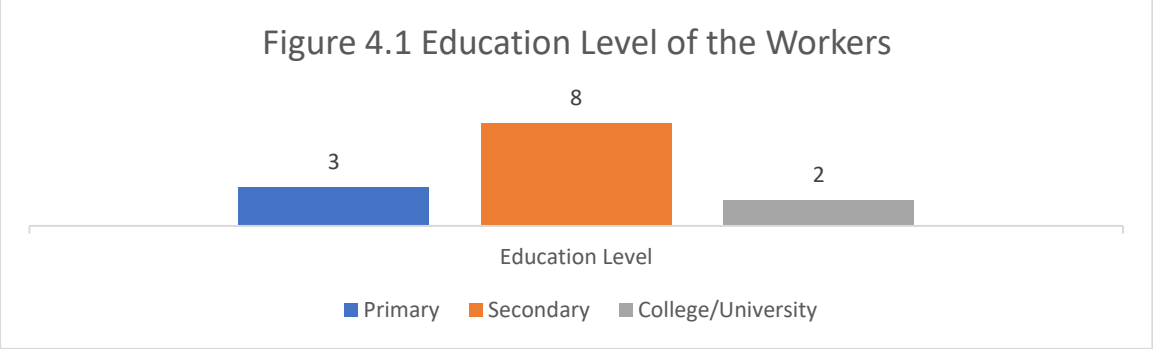
CHAPTER FOUR

PRESENTATION OF FINDINGS AND ANALYSIS

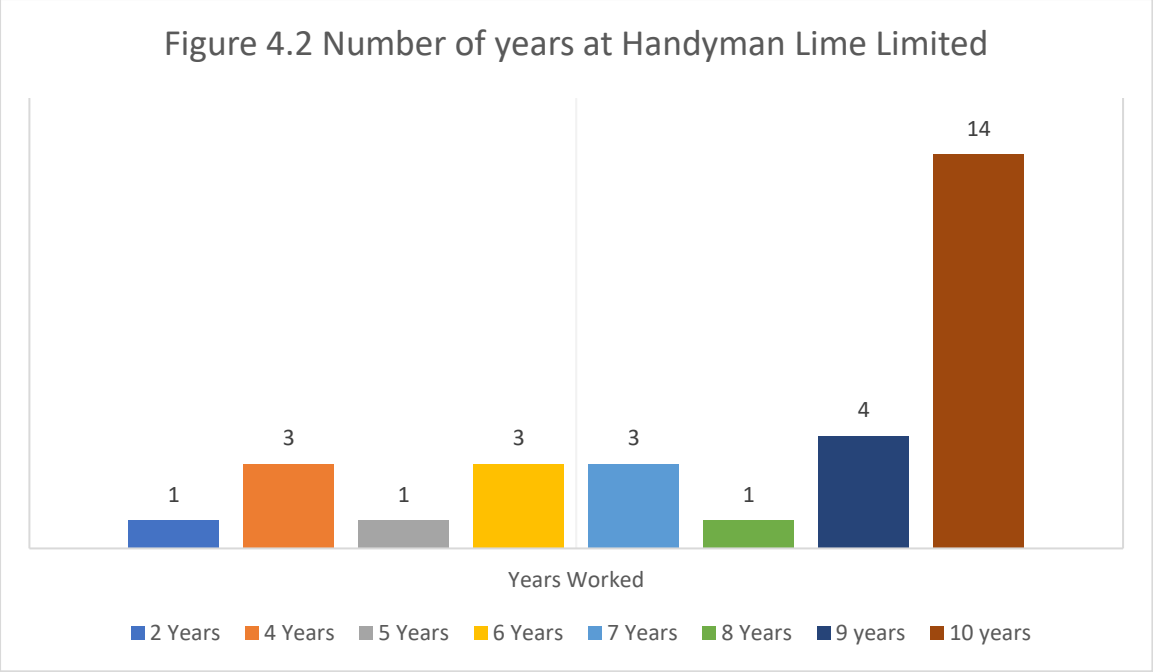
4.0 Demographic characteristics of the participants



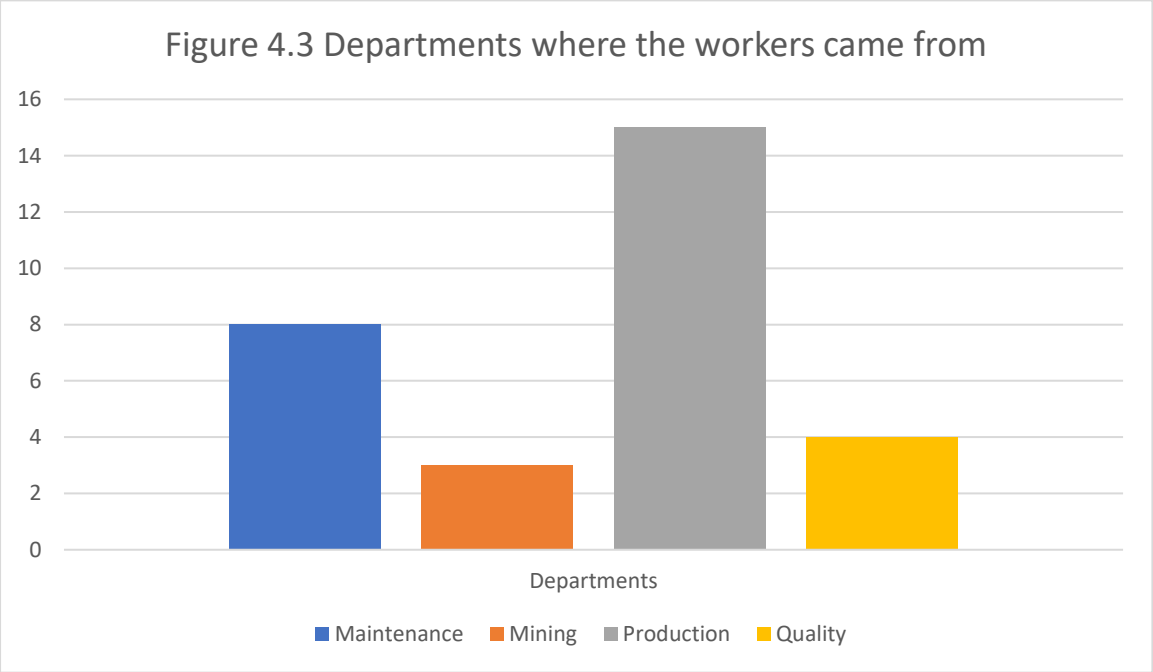
The study sample (n = 30) was predominantly male (n = 19), and females (n=11). The age of the participants ranged between 27–52 years. The mean, mode and median age were the same 39 years.



With respect to education level of the workers: primary school: n = 3; high school: n = 8; college/University: n = 19—majority of the workers had attained either college or University level education.



Workers who participated in this study with the work experience ranged between 4–10 years, with the majority having worked for 10 years as shown in figure 4.2 above.



Lastly departmental representation of the workers was as shown in figure 4.3: Maintenance department; n=8; Mining department: n = 3; Production department: n = 15 and Quality control department: n =4.

4.1 The ergonomic risks and workplace practices perceived by workers to influence their performance and health.

Under the above stated objective, the analysis of the workers' narrative responses to the question: "Could you describe the typical physical demands of your work here at Handyman's Lime?" revealed four primary themes concerning the ergonomic risks present in their work environment. These themes are: **(1) Manual Handling and Forceful Exertions, (2) Awkward and Prolonged Static Postures, (3) Repetitive Motions and High-Frequency Tasks, and (4) Adverse Environmental and Work-Space Conditions.** These risks manifest differently across various job roles, from machine operators to laboratory staff.

Theme 1: Manual Handling and Forceful Exertions

This theme captures the physical demands associated with lifting, carrying, pushing, pulling, or moving heavy objects. Workers frequently described tasks that require significant physical strength and exertion, often performed manually without adequate mechanical assistance. This was a dominant theme across roles in maintenance, production, and quality control.

- **A mechanic** highlighted the sheer weight and physicality of the core tasks: *"My job mainly involves repairing and maintaining heavy machinery... Most of the time, I'm lifting or moving heavy parts, tightening bolts, aligning shafts, or replacing worn-out components. It's very physical work..."*
- **A loader** directly linked the physical strain to the specific materials handled: *"As a loader, my work involves a lot of heavy lifting, bending, pushing, and carrying bags of lime and other materials. I mostly load and offload trucks manually, which is quite hard... The job requires a lot of physical strength because we handle heavy loads throughout most of the day."*
- The risk is made worse by poor technique, as noted by a **maintenance worker**: *"Using improper lifting techniques like bending at the waist instead of using the legs to lift equipment is a common poor practice... Applying excessive force when doing tasks... can lead to strains and sprains."*

This theme indicates a high prevalence of risks for acute injuries (like sprains and strains) and cumulative musculoskeletal disorders, particularly affecting the back, shoulders, and arms.

Theme 2: Awkward and Prolonged Static Postures

This theme refers to the strain caused by maintaining the same body position for extended periods (static postures) or working in unnatural, uncomfortable positions (awkward

postures). The data revealed that this is a widespread risk affecting both those who are constantly on their feet and those who sit for long durations.

- **Static Standing:** A **lab analyst** described the toll of remaining stationary: *"My work mainly involves standing at the lab bench for long periods while conducting limestone, coal and quicklime analysis... Standing for longer hours during reclaiming."* This was echoed by a **quality control worker** who noted *"long hours of standing and monitoring the machines."*
- **Static Sitting:** Conversely, operators face risks from prolonged sitting. An **excavator operator** stated simply, *"Mostly sitting as I am an Excavator operator,"* while a **forklift operator** added, *"I usually spend most of my time at work sitting and experiencing a lot of vibration... And also, I am mostly twisting and bending my body due to the nature of my job."*
- **Awkward Postures:** Many roles require working in constrained spaces. A **welder** provided a vivid description: *"I often lift or position large metal pieces manually... Sometimes I have to work in hot, confined spaces like inside tanks or ducts, which makes it even harder."* This was supported by another worker: *"kneeling, squatting and sitting in tiny, confined and awkward places for longer periods."*

Theme 3: Repetitive Motions and High-Frequency Tasks

This theme centers on the performance of the same physical action repeatedly, which can lead to overuse injuries and cumulative trauma disorders, particularly in the hands, wrists, and arms. This risk was most prominently described by laboratory staff and production line workers.

- **A loader on the conveyor belt** captured the cyclical nature of the work: *"Repetitive arm, wrist, and hand movements when filling, sealing, lifting, or stacking."*
- **A lab analyst** gave a detailed account of the strain from repetitive analytical procedures: *"Even when working on quick lime bagged samples where I have to titrate over 30 Samples using a motor and a pestle so my hand is motion until all samples are worked on... the process is quite long and requires you to measure different things resulting in Repetitive tasks."*
- A **welder** also identified this risk: *"Repeated arm movement, especially when moving the welding torch or other tools."*

Theme 4: Adverse Environmental and Work-Space Conditions

While not a physical posture, the environment plays a critical role in exacerbating ergonomic strain. This theme includes factors like whole-body vibration, heat, noise, dust, and confined or uneven workspaces.

- **Whole-Body Vibration:** This was a specific concern for mobile equipment operators. **A forklift operator** noted: *"I usually spend long hours sitting and driving over uneven ground, especially outdoors... This exposes us to whole-body vibration."* This is a known risk factor for chronic back pain.
- **Heat, Dust, and Noise:** A **kiln operator** linked multiple environmental stressors to physical fatigue: *"The heat from the kiln adds to the physical strain, making it quite demanding... The noise, vibration, and dust make it even more physically demanding."*
- **Confined and Uneven Spaces:** The very layout of the work area presents an ergonomic challenge. A **worker in maintenance** noted, *"working in tight or confined spaces, heights and also twisting, kneeling, bending of the body for longer periods,"* while another added, *"working in confined or uneven spaces (such as in tunnels or pits) contributes to poor concentration and poor ergonomics practices."*

These environmental factors increase overall physical and mental fatigue, which in turn raises the likelihood of errors and accidents.

Moving on, the responses to the sub-question: "Are there any tools, equipment, or work processes that you feel might contribute to physical discomfort or strain? Could you describe them?" (still under objective 1) revealed a wide range of ergonomic hazards directly linked to the **design, condition, and use of tools, machinery, and work systems**. Through inductive coding and thematic synthesis, four major themes emerged:

1. **Non-Ergonomic or Poorly Designed Tools and Equipment**
2. **Inadequate or Unavailable Mechanical Handling Aids**
3. **Poorly Designed Workstations and Control Interfaces**
4. **Hazardous Work Processes and Environmental Conditions**

These themes highlight systemic ergonomic shortcomings that contribute to physical discomfort, fatigue, and long-term musculoskeletal strain across various departments.

Theme 1: Non-Ergonomic or Poorly Designed Tools and Equipment

Workers frequently cited tools that are heavy, poorly balanced, or lack ergonomic features such as adjustable handles, vibration dampening, or proper grips. These tools require excessive force or awkward postures, leading to localized strain.

- **Heavy and Unwieldy Hand Tools:**
  A **mechanic** noted: *"Yes, the spanners and hammers we use are heavy, and sometimes we have to use them in awkward angles, which causes strain in the wrists and shoulders."*
  Another worker specifically mentioned: *"The size 55 spanner used for tightening and loosening bolts and nuts this causes so much pain on my wrist."*

  This indicates that even essential tools are contributing to **repetitive strain injuries (RSIs)** and **hand-arm vibration syndrome (HAVS)**.
- **Vibrating Tools:**
  Multiple responses highlighted risks from powered tools:
  "Yes, using heavy grinders and welding torches for long periods causes vibration and hand fatigue."
  "Extreme vibration of equipment like Grinders and drill machines causes extreme noise and hands vibrations."
  One worker explicitly linked this to a known occupational illness: *"Prolonged usage of such machinery can cause hard arm vibration syndrome."*
- **Heavy and Cumbersome Equipment:**
  Workers in the lab reported handling heavy components:
  "Yes, the disk mill barrel, which weighs 50 kg, used to prepare samples."
  "A Bomb Calorimeter requires an individual to stand and moving from one point to another when carrying the analysis."
  This shows that even in non-production roles, equipment weight and design pose significant manual handling risks.

Interpretation: The use of outdated, heavy, or non-ergonomic tools is a widespread concern. These tools increase physical load, reduce precision, and elevate the risk of chronic injuries, especially in maintenance and laboratory roles.

Theme 2: Inadequate or Unavailable Mechanical Handling Aids

A recurring issue is the lack of access to lifting and moving equipment, forcing workers to rely on manual labour for tasks that should be mechanized. This leads to overexertion and back strain.

- **Lack of Lifting Equipment:**

  Production worker: *"Sometimes we don't have enough lifting equipment like hoists or cranes nearby, so we have to move parts manually, which is tough on the back."*

  Mechanic#1: *"Yes, tools and equipment like chain blockers which we use to lift heavy equipment or spare parts... fixing and replacing of conveyor belts which are quite heavy..."*

  Mechanic#2: *"Using manual chain blocks to lift heavy components also requires a lot of pulling force."*

- **Poorly Positioned Loading Areas:**

  Loader#1: *"Sometimes the loading surfaces are not at an ideal height, which forces us to bend or reach."*

  Loader#4:*"Sometimes the pallets are placed too low or too high, forcing awkward bending or stretching."*

  This indicates that even when equipment exists, **poor workflow design** exacerbates ergonomic strain.

- **Heavy Manual Loads:**

  Loader#3:*"The bags themselves are very heavy, and when they are not sealed properly, they become even harder to handle safely."*

  Mechanic#2: *"Carrying heavy toolboxes from one section to another can also cause back pain over time."*

Interpretation: The absence or misplacement of mechanical aids shifts the burden onto workers' bodies. This reflects a systemic gap in ergonomic infrastructure, particularly in production, maintenance, and material handling areas.

Theme 3: Poorly Designed Workstations and Control Interfaces

Workers in both operational and office settings reported discomfort due to **poorly designed workstations, seating, and control panels**, leading to postural strain and fatigue.

- **Uncomfortable Seating and Lack of Support:**

  Forklift operator#1: *"The forklift seat doesn't provide enough lumbar support, and the vibration... causes lower back strain."*

  Forklift operator#1: *"The seat suspension is sometimes worn out, and the vibration*

from the rough terrain adds to body strain, especially the lower back."

Excavator operator#1: *"The excavator machine... I experience alot of vibration during operations and this is so tiring."*

- **Non-Adjustable Work Surfaces:**

  Lab tech#1: *"The lab benches and stools are not adjustable, so sometimes the working height feels uncomfortable."*

  Welder: *"Fixed welding tables that are too low make me bend constantly, which hurts my back."*

- **Poorly Positioned Controls and Screens:**

  Lab tech#1: *"The positioning of the controls sometimes forces me to stretch or hold awkward postures for too long."*

  Lab tech#2*"Control panels and screens may not be ergonomically laid out... monitors are placed too high or low."*

Interpretation: Even in roles with lower physical intensity (e.g., control room operators, lab analysts, clerical staff), poor workstation ergonomics contribute significantly to discomfort, particularly in the neck, shoulders, and lower back. The lack of adjustability and maintenance of equipment (e.g., worn seats, broken AC) compounds these issues.

Theme 4: Hazardous Work Processes and Environmental Conditions

Workers identified work processes and environmental factors that indirectly but significantly increase physical strain and fatigue.

- **Exposure to Heat and High-Temperature Equipment:**

  PW#1: *"The Eltra CHS 580... runs 24/7 at a temperature of about 1350 °C."*

  PW#2:*"Thermogravimetric analyze... operates at a temperature of about 1000°c."*

  PW#3:*"Hot plate... used for available calcium oxide analysis."*

  PW#4:*"Furnace... operates at 1000°c."*

  These conditions increase **thermal stress**, which accelerates fatigue and reduces concentration.

- **Dust and Poor Air Quality:**

  Loader#1: *"Yes, the packer machine requires us to stand for longer hours when bagging lime and we are often exposed to a lot of dust..."*

  Loader#2:*"The packaging area can get dusty and hot, which adds to fatigue."*

Dust exposure not only poses respiratory risks but also contributes to general physical discomfort.

- **Repetitive and Forceful Work Processes:**
  Mechanic#1:*"Work processes like nut and bolt tightening... can cause carpal tunnel syndrome, tendonitis..."*
  Mechanic#2:*"Greasing and lubricating... can put stress on the hands, wrists, and shoulders."*
  Mechanic#3:*"Repetitive tighting of bolts, greasing equipment or hammering during routine maintenance..."*

  These tasks, often performed with inadequate tools, create **cumulative trauma disorders** over time.
- **Lack of Rest Facilities:**
  MW: *"The lack of proper rest seating in some areas adds to fatigue."*
  PW: *"Lack of proper cooling or shaded areas also increases fatigue."*
  This shows that **recovery and rest** are not adequately supported in the work environment.

Interpretation: Ergonomic risks are not limited to physical tools but are embedded in how work is organized and where it is performed. Environmental stressors and repetitive processes amplify the physical toll of the job.

4.2 Workers' lived experiences and perspectives regarding ergonomic practices and their effects on performance and health outcomes.

With reference to the above stated objective and to the sub-question, "Have you noticed any particular aspects of your work that seem to impact your physical well-being, either positively or negatively? Could you elaborate?"; the resulting analysis directly addresses the lived experiences of workers, capturing the tangible impacts of ergonomic conditions on their health. The responses naturally branch into two overarching, interconnected themes (and sub-themes): the **Negative Physical Impacts** of the work and the **Positive Impacts and Mitigating Factors** that provide some relief or benefit.

Theme 1: Negative Physical Impacts – The Cumulative Toll on the Body

Workers overwhelmingly identified several aspects of their work that negatively affect their physical health. These impacts are not isolated incidents but a cumulative toll resulting from daily exposure to physical, environmental, and organizational stressors.

Sub-Theme 1.1: Pervasive Musculoskeletal Discomfort and Fatigue

The most commonly reported negative outcome is chronic pain and fatigue, particularly in the back, shoulders, knees, and wrists. This is directly linked to the physical demands previously identified (lifting, awkward postures, repetition).

- **Specific, Chronic Pain:** Workers described pain with a sense of permanence and routine.

"The positive side is that I stay active, which keeps me strong. But the downside is the constant body aches especially in my back, shoulders, and knees. After long days of maintenance or breakdowns, I feel stiff and tired." **(Maintenance Worker)**

"On the positive side, being active all day keeps me fit. But the downside is the back and shoulder pain that comes from lifting and bending too much. At times I feel numbness in my hands from using vibrating tools for long periods." **(Loader)**

- **Systemic Fatigue:** The sheer duration and intensity of the work lead to profound exhaustion.

"The heavy lifting and repetitive movements sometimes cause back and shoulder pain, especially after long shifts... the physical activity keeps me fit, but it can be exhausting without proper rest or rotation of tasks." **(Production Worker#14)**

"The shift runs for 12 hrs doing different tasks as an end result you knock off from work very tired and fatigued." **(Lab Analyst)**

Sub-Theme 1.2: Detrimental Environmental Exposures

Beyond physical mechanics, the work environment itself is a major source of physical strain and health risk.

- **Vibration:** A persistent concern for operators and those working near machinery.

"Yes,we are affected physically because of noise and Vibration coming from the machines... Increase in stress and muscle tension, contributing to cumulative fatigue." **(Mining Worker)**

"The constant vibrations and sitting posture cause stiffness in my lower back and shoulders." **(Forklift Operator)**

- **Heat and Poor Air Quality:** Heat from equipment and inadequate ventilation create significant discomfort and health risks.

"The heat and long hours affect me the most sometimes I feel dehydrated... On the positive side, teamwork helps..." **(Kiln Worker)**

"despite the recent installation of firmhoods, some Hydrochloric and Ammonia fumes find its own way of escaping. As a result we end up inhaling the fumes... its extremely hot in some rooms." **(Lab Analyst)**

Theme 2: Positive Impacts and Mitigating Factors – Sources of Relief and Resilience

Despite the significant negatives, workers actively identify positive aspects of their work and, crucially, specific factors that mitigate the physical strain. These insights are invaluable as they represent a roadmap for potential improvements from the workers' perspective.

Sub-Theme 2.1: The Perceived Health Benefit of Physical Activity

Many workers frame the physical nature of their jobs in a positive light, contrasting it with a sedentary lifestyle.

"On the positive side, moving around keeps me active and alert." **(Production Supervisor)**

"Fieldwork keeps me active, which is good, but the uneven terrain and long hours on foot often leave me with sore feet and back pain." **(Mining Worker)**

"Yes both positively and negatively, the positive aspect is that the body in physically l activitie which promotes good health." **(Lab Analyst)**

This perspective, however, is often tempered by the acknowledgment that the strain "outweighs the benefits."

Sub-Theme 2.2: The Buffering Effect of Supportive Work Practices

Workers clearly identify organizational and social factors that reduce physical strain. These are low-cost, high-impact interventions.

- **Job Rotation and Teamwork:** Sharing physically demanding tasks is frequently cited as a key relief mechanism.

"However, when tasks are rotated among staff, it helps reduce fatigue. Having short breaks between tests also makes a difference." **(Lab Analyst)**

"On the positive side, teamwork helps because we rotate some of the heavier tasks, which reduces the pressure on one person." **(Kiln Worker)**

- **Adequate Rest Breaks:** The ability to pause and recover is seen as critical.

"Positively yes, during the day we have two people that can operate the kiln, so it's easy to take breaks and stretch." **(Kiln Operator)**
"So currently we are been given enough days to rest off duty. so at least to have enough rest as we report for work the next we report for work." **(Production Worker#7)**

Sub-Theme 2.3: The Positive Role of Adequate Tools and Equipment
When tools and equipment are appropriate and well-maintained, they have a significant positive impact on well-being.
"Use of trolleys and folk lifts atleast helps positively than lifting and pushing heavy machinery manually." **(Maintenance Worker#6)**
"When I work with proper tools and in well ventilated areas, I feel fine and can work efficiently... On the positive side, when the machine is in good condition with proper seating and controls, it makes the job much easier and less tiring." **(Welder/Machine Operator)**
"Yes,the use of scaffolds when working on heights have a positive impact as this helps in avoiding to stretch our bodies during operations." **(Maintenance Worker#3)**

The analysis of workers' perceptions reveals a critical insight: **The negative physical impacts are not seen as an immutable condition of the job.** Workers clearly differentiate between the unavoidable physical demands of their roles and the *modifiable factors* that exacerbate or alleviate those demands.
The narrative is one of **resilience in the face of hardship**. While "constant body aches," "stiffness," and "fatigue" are accepted as part of the job, workers also point to clear solutions. The positive factors they identify—**job rotation, adequate rest, teamwork, and the provision of proper tools**—are actionable and within the control of management.
This demonstrates that workers are not merely passive recipients of ergonomic risks; they are astute observers of their own well-being who can offer practical, evidence-based suggestions for improvement. Addressing the "negatives" by systematically implementing the "positives" they have identified would represent a significant step toward improving both worker health and overall performance at Handyman's Lime Limited.

Workers' narratives to the question: **Can you describe a time when you felt that the way your work was set up either helped or hindered your ability to do your job well? What was that experience like?** provided powerful, concrete examples of how the physical setup of their work directly influences their ability to perform their jobs effectively. The accounts are consistently framed as a **duality**—contrasting experiences where the setup **helped** versus when it **hindered**. This analysis focuses on three primary themes that emerge from these contrasting experiences: (1) The Influence of Equipment Design and Condition on Performance, (2) The Impact of Workspace and Environmental Layout on Efficiency, and (3) The Effect of Organizational Factors on Cognitive and Physical Output.

Theme 1: The Influence of Equipment Design and Condition on Performance

Workers vividly describe how the state of their equipment—not just its presence but its ergonomic quality—determines their stamina, concentration, and overall productivity. The difference between a "good day" and a "bad day" is often the difference between well-maintained, adjustable equipment and old, broken-down machinery.

Contrasting Experience: Well-Designed vs. Worn-Out Equipment

- **When Equipment Helps:** Workers report a direct link between ergonomic features and enhanced performance.

*"There was a time when I was assigned a newer loader with a properly cushioned seat and adjustable armrests... That day, I worked longer without back pain or tiredness, and I was **more efficient**."*

"Once we got a newly serviced forklift with a seat that was properly cushioned and adjustable. That made a big difference I could operate for longer hours without much pain."

- **When Equipment Hinders:** Conversely, poor equipment condition is explicitly linked to reduced speed, pain, and a decline in the quality of work.

*"On the other hand, when I used older machines with broken seats and more vibration, I felt exhausted halfway through the shift. It made it **difficult to concentrate, and the output wasn't as good**."*

*"On the other hand, when the suspension or seat is worn out, I feel the bumps more, and my back starts hurting halfway through the shift, which **slows me down**."*

Interpretation: Workers perceive equipment not merely as a tool but as a partner in performance. The lived experience shows that **investing in adjustable, well-maintained equipment yields a clear return in the form of greater efficiency, longer endurance, and**

better focus. The reverse is also true: worn-out equipment actively degrades performance and increases physical strain.

Theme 2: The Impact of Workspace and Environmental Layout on Efficiency

The physical layout of the work area—from the placement of tools to the design of loading bays—has a profound impact on the smoothness and safety of operations. Workers describe how thoughtful design facilitates flow, while poor design creates "friction" that wastes time and energy.

Contrasting Experience: Accessible vs. Cramped and Inefficient Layouts

- **When the Workspace Helps:** Intelligent design and adjustments are directly linked to speed and reduced physical effort.

*"There was a time when the loading bay was adjusted to the same level as the truck platform, and that made loading **much smoother and faster**. We didn't have to bend as much, and the work felt **less tiring**."*

*"A while back, our shift leader reorganized the tool rack and placed controls at a more accessible height. It made it easier to monitor the kiln without constant bending or stretching. Before that, it was frustrating because I had to lean awkwardly... which **slowed me down**."*

*"Once, we had a new control panel installed with a better viewing angle and a stool to sit on... That small change made a big difference it was **easier to operate and less tiring**."*

- **When the Workspace Hinders:** Poor layout creates unnecessary physical strain and makes even simple tasks difficult.

*"But other times, poor lighting or cramped spaces make even simple wiring tasks **very difficult**."*

*"There was a time when I was working on the hummer mill at the kiln, and everything seemed to go wrong. The layout of the work area was a mess... It felt like I was **wrestling with the environment more than actually getting my job done**."*

"My experience was when installing a new conveyor belt in the tunnel, which is the tiny, confined space and this only allows limited movement of the body while lifting heavy equipment."

Interpretation: The workers' experiences highlight that **efficiency is a product of environmental design.** They recognize that small adjustments—like reorganizing a tool rack or matching platform heights—can drastically reduce the "wrestling with the environment"

that saps energy and time. This demonstrates an intuitive understanding of workflow and lean principles.

Theme 3: The Effect of Organizational Factors on Cognitive and Physical Output

Beyond physical tools and spaces, workers identify organizational issues—like staffing, tool accessibility, and training—as critical factors that either support or hinder their ability to do their jobs well. These factors affect both physical capacity and mental focus.

Contrasting Experience: Supportive vs. Neglectful Systems

- **When Systems Help:** The provision of the right tools and processes enables better performance.

*"There was a time when we received new surveying tripods that were lighter and adjustable. That made a huge difference during field mapping, it reduced the strain of carrying heavy equipment and made setup **faster**."*

- **When Systems Hinder:** Systemic failures are shown to lead directly to fatigue, pain, and reduced output.

Loader: *"Sometimes manpower is less and works to be done is a lot, so this results in working longer hours and lifting and pushing heavy loads with less help."* (This implies an inability to perform optimally due to overload).

"It's has hindered my ability to do my job well in the sense that most work stations don't have tools within reach, and some jobs will require you to be in a bending position for long."

Lab tech: *"There was a time when I had 80 samples to prepare, I had to get the lime samples from the packing plant to the sample preparation room, by the time I finished collecting the samples my back was already in pain, and I **couldn't even manage to prepare them**."*

Interpretation: This theme reveals that **performance is systemic.** Workers are hindered not just by a bad chair but by a system that places tools too far away, underestimates staffing needs, or fails to replace broken items. The experience of being unable to complete a task due to pain is a stark illustration of how poor ergonomics directly translates to **lost productivity**.

The analysis from the responses to the question: **How do you feel at the end of a typical workday in terms of physical fatigue or comfort? Do you think the way your work is organized contributes to this?"** delves into the **cumulative physical toll** of the workday and, critically, explores **workers' perceptions of the organizational factors** that contribute to this state. It directly addresses the link between daily work routines and long-term health outcomes.

Theme 1: The Pervasive Experience of End-of-Day Fatigue and Pain

The most dominant theme is the universal feeling of being physically depleted. Workers use strong, consistent language to describe their end-of-day state, painting a picture of cumulative strain that goes beyond simple tiredness.

- **Universal Feelings of Exhaustion:** The language is direct and stark.

"Extremely tired and exhausted."

"Tired, fatigued, back pain as well as shoulder and arm pain."

"Tired, stressed and overwhelmed."

- **Specific and Recurring Pain:** The discomfort is not generalized; it is localized in areas directly impacted by their physical tasks.

"By the end of the day, my back and feet usually hurt from standing too long." **(Lab Analyst)**

"By the end of the day, I usually feel physically drained, especially in my lower back and shoulders." **(Machine Operator)**

"I feel very tired and fatigued with back pain." **(Loader)**

Interpretation: The daily reality for a majority of workers is one of significant physical discomfort. This recurring pain and fatigue are not isolated incidents but a predictable outcome of the workday, indicating a high risk for the development of chronic musculoskeletal disorders.

Theme 2: The Perceived Contribution of Work Organization

Workers consistently and directly link their fatigue to specific, modifiable organizational practices. They demonstrate a clear understanding that the *structure* of their work—not just the content—is a primary driver of their physical state.

Sub-Theme 2.1: Inadequate Break Schedules and Shift Lengths

The most frequently cited organizational issue is the lack of sufficient recovery time. Workers clearly connect long, uninterrupted periods of work to heightened fatigue.

"The work scheduling doesn't always allow enough breaks for recovery."

"The job schedule doesn't always allow for enough breaks, which makes the fatigue worse."

"Yes, because i completely exhausted and tired and it been I work 12 hours a day."
"By the end of the day, I usually feel very tired... The organization of work, like having long shifts without enough breaks, adds to the fatigue. Shorter breaks or stretching sessions could help a lot."

Sub-Theme 2.2: Lack of Task Rotation and Variation
Workers identify the absence of variety in physical postures as a key contributor to strain. They recognize that alternating between tasks could alleviate the focused stress on certain body parts.
"I think the lack of rotation between standing and sitting tasks contributes to the fatigue."
"If the workload was better planned or rotated, it would help reduce the fatigue."
"I think if the job was organized with more rotation or sitting breaks, I'd recover faster after shifts."
"I think better task rotation could help reduce the fatigue."

Sub-Theme 2.3: High Workload Demands and Lack of Resources
Workers point to periods of intense activity and the absence of mechanical aids as organizational factors that amplify physical strain.

"Extremely tired, stressed and fatigue especially during maintenance periods when alot of operations are carried out."
"The way the work is organized with long loading sessions and few breaks adds to the physical strain."
"The way the work is organized definitely contributes to this because we have limited rest breaks and no equipment to help with heavy lifting."

Interpretation: Workers exhibit a high level of ergonomic literacy. They can pinpoint that the *organization* of their work—specifically break schedules, task design, and resource allocation—is a critical determinant of their well-being. This perception transforms the problem from an individual's inability to cope into a systemic issue that management has the power to address.

Moving on to the last sub-question under the second objective, the sub-question being: “Have you noticed any changes in your productivity or the quality of your work that you attribute to the physical demands of your job or the way work is set up?

The emerging theme was: **Productivity and Work Quality in Relation to Physical Demands and Work Setup**

Workers widely acknowledged that their **productivity and the quality of their work fluctuate depending on the physical demands of their tasks and the way the work environment is arranged**. Although a few respondents reported no noticeable change, the overwhelming majority indicated that discomfort, fatigue, and poor work organization directly reduce their efficiency and accuracy. For example, one worker explained, *“When I’m tired or my back is sore, I work slower and make more errors.”* Another shared a similar experience, noting that when their hands become sore, they tend to *“work slower and double-check results more often,”* which ultimately reduces productivity.

In manual and equipment-intensive roles, physical strain also affects safe and efficient performance. Forklift operators, for instance, pointed out that when they are tired or experiencing back pain, they *“make more cautious movements,”* which slows operations, while on comfortable days they can *“handle the forklift more smoothly and safely.”* Welders also reported a decline in work quality when uncomfortable, with one stating that *“when I’m physically strained or working in a bad position, my welds aren’t as neat, and I have to redo some parts.”*

Furthermore, respondents consistently emphasized that the layout of the workspace, the condition of equipment, and the general ergonomic setup strongly influence work efficiency. When tools are accessible, workstations are at appropriate heights, and environments are well-organized, workers report better performance. As one worker put it, *“When the workspace is comfortable and tools are easy to reach, I work faster and produce better results.”* Despite the challenges, workers described notable increases in productivity on days when:

- Ergonomic equipment (e.g., forklifts, chairs, tables) is in good condition
- Workstations are properly arranged
- Tasks are well organized with manageable workloads

- Tools are within reach and functional
- Environmental conditions are favourable

One respondent summarized this clearly: *"When I work in a well-designed environment, I concentrate better, leading to more thorough inspections and fewer mistakes."* Overall, workers consistently link declines in productivity and work quality to physical strain, poorly arranged workstations, staffing shortages, and heavy workloads. Conversely, ergonomic improvements, proper work organization, and supportive equipment noticeably enhance performance. The narratives strongly suggest that **investing in ergonomic practices and better work design would yield substantial improvements in both output and accuracy**.

4.3 The perceived challenges and barriers that workers and supervisors face in implementing ergonomic practices at Handyman Lime Limited in Masaiti

In tackling the third research objective (stated above) the following theme emerged**: Perceived Challenges and Barriers to Implementing Ergonomic Practices**

Workers and supervisors at Handyman Lime Limited reported a range of challenges that hinder efforts to introduce or improve ergonomic practices. While a few respondents mentioned no obstacles—often because they had never suggested changes—the majority described clear and recurrent barriers. These largely revolve around **budget constraints, management attitudes, slow decision-making, fear of victimization, and resistance to change**.

1. Budget Constraints and Financial Prioritization

The most frequently cited challenge was **limited budget allocation** for ergonomic improvements. Workers consistently reported that their suggestions—whether for better chairs, lighting, lifting aids, or improved workstation setups—were often dismissed due to cost concerns.

Several participants explained that management tends to focus on production-related expenses, pushing ergonomic issues aside. One worker noted, *"Sometimes when we suggest better lifting tools or improved work setups, management says there's no budget for it… They go for quick fixes like asking us to be more careful."* Another emphasized that even small tools or adjustments are dismissed, saying, *"Sometimes when I propose adjustments like changing tool heights, management sees them as unnecessary costs."*

This prioritization of production over worker comfort leaves many ergonomic needs unmet.

2. Slow or Delayed Decision-Making

Even when suggestions are acknowledged, workers expressed frustration at the **slow pace of implementation**. Many described situations where management promised to look into ergonomic concerns but failed to deliver changes in a timely manner. For instance, one worker shared, *"We're told the company will 'look into it,' but nothing happens quickly."* Another added that simple fixes like replacing worn-out seats or improving ventilation are often delayed because *"repairs will be done during the next maintenance cycle."* The prolonged waiting periods create discouragement and reduce motivation to report issues again.

3. Management Domination and Lack of Employee Input

Many respondents felt that the decision-making process is **top-down**, leaving little room for employee involvement. Several workers said improvements are only made if management agrees with or supports them. As one respondent put it, *"If your suggestion doesn't align with management, nothing is done about it."* Another remarked, *"Usually management has the final say in all matters at work,"* highlighting a lack of participatory structures for workers to influence change.

This challenge is compounded by a perception among some supervisors that ergonomics is secondary or unnecessary. For example, one worker noted, *"There's a perception that as long as the machine runs, it's fine—worker comfort isn't always a top priority."*

4. Fear of Victimization and Speaking Out

A significant barrier identified by workers is the **fear of being labelled as troublesome, lazy, or resistant to company norms**. Some employees reported hesitating to raise issues because supervisors and colleagues might react negatively. One respondent stated, *"At times it's difficult to voice out, in fear of being labelled as the employee that complains a lot."* Another added, *"Our supervisors tell us to keep quiet about certain things, even if it is concerning safety… so as to keep our jobs."* This culture of silence discourages workers from reporting ergonomic concerns, resulting in unresolved challenges that continue to affect productivity and health.

5. Resistance to Change Among Workers and Supervisors

Another emerging theme was **resistance to change**. Some employees noted that their colleagues are accustomed to existing work setups and therefore reluctant to support new ergonomic practices. One respondent explained, *"It's hard to convince people who have gotten used to the work setup; plus there is lack of support from management."* Similarly, another worker shared that when raising ergonomic issues, *"that individual is deemed to be lazy and vocal in the company."* This cultural resistance means ergonomic improvements are not always embraced, even when they are beneficial.

6. Lack of Awareness and Knowledge About Ergonomics

A smaller but important group of participants stated that they had not encountered obstacles simply because they had not previously **recognized or understood ergonomics**. One person explained, *"No, because I personally didn't know about ergonomic practices."*
This indicates a gap in training and awareness that limits workers' ability to identify and advocate for ergonomic improvements.

7. Insufficient Staffing and Workload-Related Barriers

Some workers expressed that inadequate staffing prevents ergonomic practices from being adopted—for example, suggestions for increasing manpower to allow job rotation or rest breaks are dismissed due to financial pressure. As one worker stated, *"We have suggested that management increases manpower, but the response is always that there is no money."*
Thus, workload pressures and tight production targets often overshadow concerns about ergonomics.

CHAPTER FIVE
DISCUSSION OF RESULTS AND ANALYSIS

5.0.0 Overview

This study examined workers' perceptions, lived experiences, and the contextual barriers affecting the implementation of ergonomic practices at Handyman Lime Limited in Masaiti. The discussion integrates the findings with existing literature in occupational health and ergonomics. The themes emerging from the study align closely with the three specific research objectives.

5.1.1 Ergonomic Risks and Workplace Practices Affecting Worker Performance and Health

Workers identified multiple ergonomic risks, including heavy lifting, awkward postures, prolonged sitting or standing, poorly adjusted workstations, and the physical strain associated with machinery such as forklifts, front loaders, and welding equipment. These findings are

consistent with the wider body of evidence in a qualitative study by Janizadeh et al., (2025) which looked at the safety and human factors challenges in process control rooms operators, discovered that the development of musculoskeletal disorders was one of the prevalent complaints by workers.

Many participants described back pain, shoulder strain, and fatigue resulting from manual handling and repetitive tasks. These experiences mirror global trends indicating that workers in industrial settings are particularly vulnerable to musculoskeletal injuries due to forceful exertion and non-neutral postures (Kabir et al., 2022). Furthermore, workers reported that inadequate tools or improper equipment set-up increased physical strain. Such challenges align with findings by (Janizadeh et al., 2025), who note that ergonomic mismatches between workers and tools significantly elevate biomechanical stress.

Ergonomically supportive conditions—such as appropriate workstation height, proper lighting, effective cooling systems, and well-maintained machinery—were reported to improve performance and reduce discomfort. This supports research by Singh et al. (2017) and Brito et al. (2019) which demonstrates that improved ergonomic design reduces physical strain and enhances task efficiency. Overall, the findings show that ergonomic risks at Handyman Lime stem largely from insufficient equipment adjustments, heavy physical demands, and limited investment in worker comfort—all of which directly influence productivity and health.

5.1.2 Workers' Lived Experiences of Ergonomics and Their Effects on Performance and Health Outcomes

The narratives revealed that workers experience daily fluctuations in productivity and health that they directly attribute to ergonomic conditions. Workers consistently reported that physical discomfort—especially back pain, fatigue, or soreness—led to slower work pace, reduced accuracy, and increased error rates. These experiences strongly align with literature demonstrating that fatigue and musculoskeletal pain significantly impair cognitive and motor performance (Rajan and Kumar, 2015).

Many workers noted that poor workstation design, lack of supportive seating, or uncomfortable machine cabins affected concentration and attention to detail. Research similarly shows that poor ergonomic conditions impair vigilance, coordination, and reaction time, which can compromise both productivity and safety (Kabir et al, 2022). For example, forklift operators

explained that discomfort made them more cautious and slower, reflecting the biomechanical-cognitive interaction described by Janizadeh et al., (2025) where physical strain reduces operational precision.

Conversely, workers also reported that good ergonomic conditions improved efficiency, accuracy, and general wellbeing. These insights align with studies emphasising that ergonomically optimised environments enhance job satisfaction, reduce fatigue, and improve output quality (Zhang et al., 2018). The finding that workers perform better in cooler, well-organized spaces parallels evidence that environmental ergonomics significantly improves both cognitive performance and musculoskeletal comfort (Zhang et al., 2018). Overall, workers' lived experiences affirm that ergonomics plays a central role in shaping both physical health and productivity across diverse job roles.

5.1.3 Perceived Challenges and Barriers in Implementing Ergonomic Practices

The findings reveal substantial organisational and cultural barriers that hinder ergonomic improvements at Handyman Lime. Workers frequently cited **budget constraints**, **management resistance**, **slow decision-making**, and a perception that ergonomic concerns are secondary to production demands. Similar barriers have been widely reported in developing-country industrial settings, where limited financial resources and competing priorities restrict investment in ergonomic solutions (Kabir et al., 2022).

A recurring theme was the belief among management that as long as machinery remains functional, worker comfort is not an urgent priority. This mirrors findings by Silva et al., (2024) who argue that organisations often undervalue ergonomics because its benefits—such as reduced injury rates and increased productivity—are not immediately visible. Participants also described delays in repairing equipment, replacing worn-out seats, or approving simple ergonomic enhancements. This aligns with research by Kabir et al. (2022), which shows that bureaucratic delays and poor maintenance culture hinder ergonomic implementation in industrial environments.

Workers also reported psychosocial barriers, including fear of being labelled "complainers," reluctance among colleagues to raise issues, and a workplace culture emphasizing endurance over comfort. Such socio-cultural barriers are well documented in the ergonomics literature, where worker silence and inadequate participatory structures negatively affect reporting and

safety communication (Davis et al.,, 2020). Additionally, several respondents noted that supervisors sometimes discouraged reporting ergonomic concerns—a finding that echoes studies showing that hierarchical organisational structures suppress upward communication about workplace risks (Müller et al. 2021).

Another barrier was inadequate training and awareness of ergonomic practices, particularly among workers who stated they had "never suggested improvements" because they did not know ergonomics existed. This reflects global findings that ergonomic implementation is challenged by limited knowledge, insufficient training, and lack of worker empowerment (Kabir et al., 2022).

Overall, the barriers observed at Handyman Lime illustrate the complex interplay between financial limitations, institutional culture, hierarchical decision-making, and inadequate worker participation—factors that collectively constrain the adoption of effective ergonomic practices.

5.2 Limitations of the study

Qualitative studies inherently carry certain limitations that can influence the validity and reliability of their findings, and these apply to the present study as well. One key limitation is the restricted generalizability of the results. Because the sample size is relatively small (n=30) and was selected non-randomly, the findings may not fully represent broader populations outside Masaiti in the Copperbelt Province. As a result, any conclusions drawn should be interpreted with caution when considering different contexts or demographic groups.

Another important concern is the potential for social desirability bias. Given the sensitive nature of the subject under investigation, participants may have offered responses they believed to be more acceptable or favourable, rather than expressing their true opinions or experiences. This tendency could lead to either an overestimation or underestimation of actual levels of awareness and attitudes. Closely related to this is the issue of self-reporting bias. Respondents may not always provide accurate accounts of their own work experiences, particularly if they feel uncomfortable, stigmatized, or fear being reported to management which would lead to them losing their jobs. Such inaccuracies can affect the credibility of the resulting data.

Lastly, time and resource constraints pose additional challenges. Qualitative research often demands considerable effort, especially when conducting in-depth interviews or focus group discussions. Due to these practical limitations, the study may not have included more participants or explored issues with greater depth. Consequently, while the study offers valuable insights, these limitations must be acknowledged when interpreting its findings.

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

The This study set out to explore ergonomic risks, workplace practices, and the lived experiences of workers at Handyman Lime in Masaiti, with the aim of understanding how these factors influence performance, health, and the implementation of safe work practices. The findings reveal a consistent pattern: workers perceive a strong link between physical strain, workplace design, and their daily productivity and well-being. Across departments, participants reported that fatigue, back pain, repetitive strain, heavy lifting, and inadequate workstation setup contributed to slower work pace, reduced concentration, and increased errors. Conversely, when working conditions were more comfortable—such as having well-arranged workstations, appropriate tools, mechanical handling equipment, or cooler environmental conditions—workers noted improved focus, efficiency, and output. These observations strongly affirm the first objective, showing that workers are highly aware of the ergonomic risks embedded in their tasks and how these affect their performance and health.

In relation to the second objective, the workers' lived experiences illustrated the human dimension of ergonomic challenges. Many described moments of slowed productivity linked to discomfort, soreness, or job design, while others highlighted how improved setups provided meaningful relief and enhanced the quality of their work. The accounts also revealed how workers adapt their behaviour—such as double-checking tasks, working more cautiously, or slowing down—to manage physical strain. These experiences emphasise that productivity and health are interconnected and that workers actively attempt to cope with ergonomic stressors even when systems and structures do not adequately support them.

The study also uncovered several barriers that hinder effective ergonomic practice, addressing the third objective. Staffing shortages and absenteeism were repeatedly highlighted, with workers noting that reduced manpower significantly affected workloads and target completion. Some workers pointed to a workplace culture that prioritised endurance over safety, limiting open discussion of discomfort or ergonomic concerns. Additionally, insufficient machinery, outdated tools, and inadequate workspace organisation constrained workers' ability to work safely and efficiently. These challenges reflect broader organisational and cultural factors that influence the success of ergonomic interventions, suggesting that improving ergonomics

requires not only equipment and training but also shifts in management attitudes and resource allocation.

Overall, the study demonstrates that ergonomic risks at Handyman Lime are both recognised by workers and deeply intertwined with their capacity to meet performance expectations. The findings underscore the significance of ergonomics as a determinant of occupational health, productivity, and operational efficiency. By synthesising workers' perceptions, experiences, and barriers, the research provides valuable insight into where interventions may be most impactful—such as redesigning workstations, increasing mechanical support, improving staffing levels, and cultivating a culture that values worker well-being. These results align closely with the study objectives and highlight the importance of integrating ergonomic considerations into everyday workplace practices.

6.2 Recommendations

The following are the recommendations; directed at the Management of Ndola Lime Company.

1. **Strengthen management commitment and dedicate resources to ergonomics:** Policy makers and senior management should prioritise ergonomics by allocating clear budgets, personnel, and timelines for ergonomic improvements. Demonstrating visible leadership commitment is critical for building a safety-first culture and ensuring sustained adherence to ergonomic standards.
2. **Introduce and enforce company-wide ergonomic standards and policies:** Handyman Lime should develop and implement formal ergonomic policies outlining acceptable lifting practices, workstation design requirements, tool standards, and posture guidelines. These standards must be enforced across all departments to reduce exposure to ergonomic risks and align operations with best practices.
3. **Integrate routine ergonomic assessments into existing safety and monitoring systems:** Ergonomic risk evaluations, job safety analyses, and scheduled inspections should be embedded within the company's health and safety programmes. Policymakers should ensure that these assessments guide decision-making, track progress, and inform ongoing improvements.
4. **Improve the provision, accessibility, and maintenance of ergonomic equipment:** Decision-makers must ensure that workers have reliable access to appropriate tools, adjustable workstations, PPE, mechanical lifting aids, and other ergonomic equipment.

Regular maintenance schedules and timely replacement of faulty equipment should be mandatory to support safe practices.

5. **Provide continuous, ergonomics-focused capacity-building for all workers and supervisors:** Structured and recurring training programmes should equip employees with practical skills on safe body mechanics, correct equipment handling, early reporting of discomfort, and recognition of ergonomic hazards. Supervisors should be trained to model and reinforce correct practices.
6. **Establish a participatory and responsive worker feedback system:** Management should institutionalise platforms—such as safety committees, digital reporting channels, or suggestion systems—where workers can consistently voice ergonomic concerns. Feedback must be acted upon promptly to strengthen trust and enhance the effectiveness of ergonomic interventions.

6.3 Suggestions for future research

Future research should consider conducting longitudinal studies to examine how ergonomic improvements influence worker health, performance, and musculoskeletal outcomes over time at Handyman Lime and similar industrial settings. Additional qualitative research could explore the perspectives of management and occupational health officers to better understand organisational decision-making processes related to ergonomics. Quantitative studies assessing the prevalence and severity of musculoskeletal disorders among workers would complement qualitative insights and provide stronger evidence for targeted interventions. Comparative studies across different mining or lime-processing companies in Zambia may also help identify best practices and contextual factors influencing ergonomic implementation. Lastly, future research could evaluate the effectiveness of specific ergonomic interventions—such as training programmes, mechanical lifting aids, or workstation redesigns—to determine which strategies most effectively reduce risks and enhance worker productivity.

References

Abaya, P.M., (2023). *An Investigation into Occupational Safety and Health Compliance on Construction Sites in Nairobi City County, Kenya* (Doctoral dissertation, JKUAT-COETEC). Available at http://ir.jkuat.ac.ke/handle/123456789/6173

Amponsah, S. K., Baafi, N.K.A. and Mensah J., (2017). *Ergonomics in the Ghanaian manufacturing industry*. Journal of Ghana Science Association, 17(2), 1-9.

Belkacem, A., Ciorna, V., Petry, F. and Ghoniem, M (2018). *Ergonomic practices and workers' health in the Moroccan manufacturing industry.* Journal of Occupational Health, 60(3), 253-258.

Bernard, B. P. (1997). *Musculoskeletal disorders and workplace factors: A critical review of epidemiologic evidence for work-related musculoskeletal disorders of the neck, upper extremity, and low back*. U.S. Department of Health and Human Services.

Bonsu, W.S., Adei, D. and Agyemang-Duah, W., (2020). *Exposure to occupational hazards among bakers and their coping mechanisms in Ghana*. Cogent medicine, *7*(1), p.1825172. Available at https://www.tandfonline.com/doi/full/10.1080/2331205X.2020.1825172#abstract

Braun, V., & Clarke, V. (2006). *Using thematic analysis in qualitative research. Qualitative Research*, 3(2), 175-191. https://methods.sagepub.com/foundations/thematic-analysis

Brito, M.F., Ramos, A.L., Carneiro, P. and Gonçalves, M.A., (2019). Ergonomic analysis in lean manufacturing and industry 4.0—A systematic review. Lean Engineering for Global Development, pp.95-127. Available at: https://link.springer.com/chapter/10.1007/978-3-030-13515-7_4

Chisenge, S., (2017). *Occupation-related low back pain and functional activities of mineworkers from Solwezi District, Zambia*, Available at: https://hdl.handle.net/10566/19394

Davis, K. R., Kotowski, S.E., Daniel, D., Gerding, T., Naylor, J. and Syck, M (2019). Ergonomic practices and worker performance. Journal of Occupational Rehabilitation, 29(2), 149-162.

Dempsey, P. G., McGorry, R. W., Maynard, W. S. (2005). *A survey of tools and methods used by certified professional ergonomists.* Applied Ergonomics, *36*(4), 489-503.

Detroja, S., Mahajan, R. & Sheth, A. (2025). *Comprehensive investigation of ergonomic challenges and predictors of work-related musculoskeletal disorders among intensive care unit nurses of Western India through convergent mixed methods study*. BMC Musculoskelet Disord **26**, 127 (2025). https://doi.org/10.1186/s12891-025-08379-4

El-Sayed, A. M., et al. (2016). *Ergonomic risks and practices in the Egyptian textile industry*. Journal of Textile and Apparel Technology Management, 10(2), 1-10.

Guest, G., Bunce, A., & Johnson, L. (2017). *How many interviews are enough? An exploration of sample size and saturation in qualitative research. Psychology of Health & Medicine*, 22(8), 871-886. https://journals.sagepub.com/doi/pdf/10.1177/1525822X05279903

Hendrick, H.W., (2003). *Determining the cost–benefits of ergonomics projects and factors that lead to their success*. *Applied ergonomics*, *34*(5), pp.419-427. Available at: https://doi.org/10.1016/S0003-6870(03)00062-0

International Labour Organization (ILO). (2020). *Work-related musculoskeletal disorders: Fact sheet*. Geneva: ILO, https://www.ilo.org/search?search_api_fulltext=committee+on+occupational+safety+and+health&sort_by=search_api_relevance&f%5B0%5D=language%3Aen

Janizadeh, R., Choobineh, A., Mokarami, H. and Jahangiri, M., (2025). *A qualitative study of safety and human factors challenges in process control rooms operators*. Scientific Reports, 15(1), p.27363.

Kabir, H., Maple, M., Islam, M.S. and Usher, K., (2022). *A qualitative study of the working conditions in the readymade garment industry and the impact on workers' health and wellbeing*. Environmental and Occupational Health Practice, 4(1), pp.2021-0020.

Kaluba, M. C., (2020). *Ergonomic practices and workers' health in the Zambian mining industry.* Journal of Occupational Health, 62(3), 253-258.

Karwowski, W., Marras, W. S. (2003). *Occupational ergonomics: Principles of work design*. CRC Press.

Koma, B.S., Bergh, A.M. and Costa-Black, K.M., (2019). *Barriers to and facilitators for implementing an office ergonomics programme in a South African research organisation*. Applied Ergonomics, *75*, pp.83-90. Available at: https://doi.org/10.1016/j.apergo.2018.09.003

Kroemer, K.H., (2006). *Designing for older people.* Ergonomics in Design, *14*(4), pp.25-31. Available at: https://journals.sagepub.com/doi/abs/10.1177/106480460601400407

Kunda, R., Frantz, J. and Karachi, F., (2013). *Prevalence and ergonomic risk factors of work-related musculoskeletal injuries amongst underground mine workers in Zambia. Journal of occupational health*, *55*(3), pp.211-217. Available at: https://www.jstage.jst.go.jp/article/joh/55/3/55_11-0175-FS/_pdf

Lee, S. (2018*). Ergonomic practices and workers' performance*. Journal of Manufacturing Systems, 50, 147-155.

Mallon, W., (2024). *Ergonomics Regulations 2019, promulgated under the Occupational Health and Safety Act No. 85 of 1993, as amended*. Occupational Health Southern *Africa*, *30*(1), pp.27-28. Available at: https://www.occhealth.co.za/_assets/articles/352/2474.pdf

Mandal, N., Naidoo, R. N., Channa, K. (2016). *Ergonomic challenges in South Africa's mining sector and their impact on workers' health*. Occupational Health Southern Africa, 22(5), 14-20.

Maningire, N., (2018). *An analysis of the association between ergonomic risk factors and illnesses in narrow reef mining in Zimbabwe: a case of Goldfields of Mazowe.* Available: https://cris.library.msu.ac.zw/bitstream/11408/3612/1/final%20dissertation%20with%20all%20pages%20nyasha.pdf

Mueller, C., Sauter, M., Barthelme, J. and Liebers, F., (2021). *The association between manual handling operations and pain in the hands and arms in the context of the 2018 BIBB/BAuA Employment Survey*. *BMC Musculoskeletal Disorders*, *22*, pp.1-13. Available at: https://link.springer.com/article/10.1186/s12891-021-04495-z

Mwape, A. M., (2019). *Ergonomic risks and practices in the Zambian construction industry*. Journal of Construction Engineering and Management, 145(10), 04019075.

Nakamura, K., (2017). Ergonomic risks and practices in the construction industry. Journal of Construction Engineering and Management, 143(10), 04017075.

Namumba, E. and Mushabati, F., (2018). *The impact of occupational health hazards and injuries on livelihoods of affected workers: A case of Kitwe District* (Doctoral dissertation,

Mulungushi University Medical Library), Available at: http://dspace.unza.zm/handle/123456789/5402

Ndiwa, S.C., Gatebe, E. and Mwenga, A., (2018). *Ergonomic Risk Factors in Building Construction Sites in Mombasa County*, Kenya. International Journal of Science and Research (IJSR) ISSN (Online): 2319-7064. Available at: https://www.ijsr.net/archive/v7i4/ART20181825.pdf

Neumann, P. W. and Dul, J., (2010). *Human factors: spanning the gap between OM and HRM.* International journal of operations & production management, *30*(9), pp.923-950. Available at: https://www.emerald.com/insight/content/doi/10.1108/01443571011075056/full/html

Nkhata, L.A., Brink, Y., Ernstzen, D. and Louw, Q.A., (2020). *Nurses' perspectives about context specific job factors and coping strategies for back pain experiences among nurses in Lusaka, Zambia: a qualitative study*. International Journal of Nursing and Midwifery, *12*(1), pp.22-31.

Nkhata, L.A., Esterhuizen, T.M., Siziya, S., Phiri, P.D.C., Munalula-Nkandu E., Shula, H. (2015). *The Prevalence and Perceived Contributing Factors for Work-Related Musculoskeletal Disorders Among Nurses at the University Teaching Hospital in Lusaka, Zambia*. Science Journal of Public Health. Vol. 3, No. 4, 2015, pp. 508-513. doi: 10.11648/j.sjph.20150304.18

Ogbogu, C. O., Akinyemi, O., Umeokafor, N. (2017). *Occupational health and safety challenges in Nigerian construction and manufacturing industries*. Journal of Occupational Safety and Health, 15(3), 120-135.

Ogundiran, O.O., Agbonlahor, E., Oke, K.I. and Ogunsanya, G.I., (2020). *Work-related musculoskeletal pain and characteristics of brewery workers in southwest Nigeria-a pilot study*. Revista Pesquisa em Fisioterapia, *10*(2), pp.149-155. Available at: https://www5.bahiana.edu.br/index.php/fisioterapia/article/view/2742

Phiri, A.K., Juba, O.O., Baladaniya, M., Regal, H.Y.A. and Nteziryayo, T., (2024). *Strategies for quality health standards*. Cari Journals USA LLC..

Polit, D. F., & Beck, C. T. (2017). *Nursing research: Principles and methods* (9th ed.). Wolters Kluwer.

Pransky, Glenn & Dempsey, Patrick. (2004). *Practical Aspects of Functional Capacity Evaluations*. Journal of occupational rehabilitation. 14. 217-29. 10.1023/B:JOOR.0000022763.61656.b1. Available at: https://www.researchgate.net/publication/8549146_Practical_Aspects_of_Functional_Capacity_Evaluations

Punnett, L., Wegman, D. H. (2004). *Work-related musculoskeletal disorders: The epidemiologic evidence and the debate*. Journal of Electromyography and Kinesiology, 14(1), 13-23.

Rahman, M.S., (2019). *A cross-sectional study of work-related Musculoskeletal disorders among Construction workers in Bangladesh* (Doctoral dissertation, Khulna University of Engineering & Technology (KUET), Khulna, Bangladesh). Available at: http://dspace.kuet.ac.bd/bitstream/handle/20.500.12228/835/Full%20Thesis.pdf?sequence=1&isAllowed=y

Rajan, L.S. and Kumar, A.A., (2015). *Analysis of Ergonomics*. International Journal of Management and Social Science Research Review, 1(1), pp.184-193. Available at https://d1wqtxts1xzle7.cloudfront.net/55705354/Analysis_Of_Ergonomics_A_Study_Conducted_in_Puducherry_State_of_Specific_Industry-libre.pdf?1517653163=&response-content-disposition=inline%

Silva, L.K.D., Silva, A.T.C.D., Moreno, C.F., Souza, E.R.M.D., Nunes, T.F.B., Souza, L.A.H.D., Vergara, L.G.L. and da Silva, J.M.N., (2024). *Assessment of the musculoskeletal discomfort scale for upper limb among workers in inner Brazil*. Work, 78(1), pp.83-97. Available at: https://journals.sagepub.com/doi/abs/10.3233/WOR-230439

Singh, A.K., Meena, M.L., Chaudhary, H. and Dangayach, G.S., (2017). *Ergonomic assessment and prevalence of musculoskeletal disorders among washer-men during carpet washing: guidelines to an effective sustainability in workstation design.* International Journal of Human Factors and Ergonomics, 5(1), pp.22-43. Available at: https://www.inderscienceonline.com/doi/abs/10.1504/IJHFE.2017.088416

Siwale, J. S., et al. (2016). *Ergonomic risks and practices in the Zambian mining industry*. Journal of the Southern African Institute of Mining and Metallurgy, 116(10), 931-938.

Smith, P. M., Saunders, R., Lifshen, M., Black, O., Lay, M., Breslin, F.C., LaMontagne, A.D. and Tompa, E (2015). *Ergonomic practices and worker health*. Journal of Occupational and Environmental Medicine, 57(5), 531-536.

Terre Blanche, M., Durrheim, K., & Painter, D. (2006). *Research in practice: Applied methods for social sciences* (2nd ed.). University of Cape Town Press.

World Health Organization (WHO). (2020). *Work-related musculoskeletal disorders.* Retrieved from https://www.who.int/health-topics/musculoskeletal-disorders

Yahaya, T., Sani, K.A., Oladele, E., Yawa, E., Musa, M., Abubakar, M., Sulaiman, R. and Bilyaminu, M., (2024). *Cement Dust Exposure and Risk of Hyperglycemia and Overweight among Artisans and Residents Close to a Cement Factory in Sokoto*, *Nigeria*. arXiv preprint arXiv:2407.00420. Available at: https://arxiv.org/abs/2407.00420

Zgambo, J., (2015). *Occupational hazards and use of personal protective equipment among small scale welders in Lusaka, Zambia* (Master's thesis, The University of Bergen), Available at: https://hdl.handle.net/1956/10194

Zhang, Y., et al. (2018). *Ergonomic risks and practices in mining*. Journal of Mining Science, 54(3), 537-545.

APPENDICES

Appendix 1: Interview Guide for the Workers

EXPLORING THE IMPACT OF ERGONOMIC PRACTICES ON WORKERS' PERFORMANCE AND HEALTH AT HANDYMAN'S LIME LIMITED COMPANY IN MASAITI

Interview Guide

Introduction:

Thank you for agreeing to participate in this study. This interview aims at exploring the impact of ergonomic practices on workers' performance and health at Handyman's Lime Limited Company in Masaiti. Your responses will be kept confidential and anonymous.

Demographic Information:

- Age:
- Gender:
- Highest level of education completed:
- Department:

Work History

- How long have you worked at Handyman Lime Company Limited.
- Are you a full-time employee (not on part time or on internship)

Objective 1: To identify specific ergonomic risks and practices that contribute to workers' performance and health at Handyman Lime in Masaiti.

1. Could you describe the typical physical demands of your work here at Handyman's Lime?
2. Are there any tools, equipment, or work processes that you feel might contribute to physical discomfort or strain? Could you describe them?
3. In your opinion, what are some of the existing practices or arrangements in your work environment that you believe are designed to support your physical comfort and safety? How effective do you think these are?
4. Have you noticed any particular aspects of your work that seem to impact your physical well-being, either positively or negatively? Could you elaborate?

5. Thinking about your daily tasks, are there any specific activities that you find particularly challenging or physically demanding? What makes them so?

Objective 2: To gather insights on workers' experiences related to ergonomic practices on worker's performance and health outcomes.

1. Can you describe a time when you felt that the way your work was set up either helped or hindered your ability to do your job well? What was that experience like?
2. How do you feel at the end of a typical workday in terms of physical fatigue or comfort? Do you think the way your work is organized contributes to this?
3. Have you noticed any changes in your productivity or the quality of your work that you attribute to the physical demands of your job or the way work is set up?

Objective 3: To identify the challenges and barriers to implementing ergonomic practices at Handyman's Lime Limited Company in Masaiti.

1. Are there any obstacles you've encountered when trying to suggest or implement changes to improve the physical aspects of your work? Could you tell me about those?/ What do you think might prevent the company from adopting or consistently using more ergonomic practices?

Concluding Questions:

1. If you could make one change to improve the ergonomic aspects of your work, what would it be and why?
2. Is there anything else you would like to share about your experiences with ergonomic practices and their impact on your performance and health at Handyman's Lime Limited?

Final Remarks

Thank you again for your valuable time and contributions.

Appendix 2: Informed Consent Form

Informed Consent Form

Title: EXPLORING THE IMPACT OF ERGONOMIC PRACTICES ON WORKERS' PERFORMANCE AND HEALTH AT HANDYMAN'S LIME LIMITED COMPANY IN MASAITI

1. Introduction:

You are invited to participate in a research study which aims at exploring the impact of ergonomic practices on workers' performance and health at Handyman's Lime Limited Company in Masaiti. This study is being conducted by Malama Chisha, 4th Year student at the University of Lusaka.

2. What is the purpose of the study?

This study aims at exploring the impact of ergonomic practices on workers' performance and health at Handyman's Lime Limited Company in Masaiti

3. What will you be asked to do?

If you agree to participate, you will be asked to complete an interview. The interview will take approximately 30-45 minutes to complete. The interview will be audio-recorded with your permission.

4. What are the risks and benefits of participating?

There are no known risks associated with participating in this study. The benefits of participation include contributing to a better understanding of your insights on workers' experiences related to ergonomic practices on worker's performance and health outcomes and to identify the challenges and barriers to implementing ergonomic practices.

5. Confidentiality and anonymity:

Your participation in this study is completely voluntary. You have the right to withdraw from the study at any time without any consequences. All information collected will be kept confidential and anonymous. Your names will not be linked to any of the data collected.

6. Contact information:

If you have any questions about the study, you can contact the University of Lusaka at [Phone Number] or [Email Address].

7. Your Consent:

We understand that by signing below, you are indicating that you have read and understood the information provided in this consent form. You are also indicating your voluntary participation in this study.

Partner 1:

- Name (printed): _____
- Signature: _____
- Date: _____

A copy of this consent form will be provided to you for your records.

Appendix 3: Work Plan

ACTIVITY	March – April 2025	May 2025	June – August 2025	September – December 2025
Chapter 1				
Chapter 2				
Chapter 3				
Proposal Defense				
Proposal Submission				
Ethical Clearance				
Data Collection				
Chapter 4				
Chapter 5				
Chapter 6				
Dissertation Submission				

Appendix 4: Budget

Items	Cost (K)
Plain Paper	300.00
Writing Pads	200.00
Pens	50.00
Printing	400.00
Photocopying	150.00
Talktime	100.00
Transport	500.00
Miscellaneous	300.00
Total	K2000.00

Appendix 5: UNILUS-REC Approval Letter

UNIVERSITY *of* LUSAKA

Passion for Quality Education: Our Driving Force

UNIVERSITY OF LUSAKA RESEARCH ETHICS COMMITTEE (UNILUS-REC)

Plot No. 37413, Off Alick Nkhata Mass Media. P. O Box 36711, Lusaka.
Phone: +260211258505, 258409 Fax +260211233409; Cell +260976075850,961917862,
E-mail:unilus@zamnet.zm,ictar@zamnet.zm

UNILUS-RESEARCH ETHICS COMMITTEE

Ref no: FWA00033228-930(08)/(08)/{2024}

Date: 07 July 2025

STUDENT NAME: **Mrs. MALAMA CHISHA**

IMPACTS OF ERGONOMIC PRACTIES ON WORKERS PERFOMANCE AND HEALTH

The above research was submitted to the research ethics committee for review. The study has no major ethical problems and is approved subject to the following:

1. The study cannot be changed without express permission of the UNILUS research ethics committee.
2. Approval from the necessary authority should be sought.

Professor Kasonde Bowa

MSc(Glasgow),M.Med(UNZA),FRCS(Glasgow),FACS,FCS,DPH(LSTMH),MPH(UCL)

Chairman- UNILUS REC

Professor of Urology and Consultant Urologist

Deputy Vice-Chancellor – Research and Innovation

Executive Dean - School of Medicine and Health Sciences

Appendix 6: NHRA Approval Letter

NATIONAL HEALTH RESEARCH AUTHORITY
Lot No. 18961/M, off Kasama Road, Chalala, P.O. Box 30075, LUSAKA
Tell: +260211 250309 | Email: znhrasec@nhra.org.zm | www.nhra.org.zm

NHRA10603/30/09/2025
The Principal Investigator,
Malama Chisha,
Unilus,

Dear Malama Chisha,

Re: Request for Authority to Conduct Research

The National Health Research Authority Is in Receipt of Your Request for Authority to Conduct Research Titled "**Exploring the impacts of Ergonomics practices on workers performance and health at Handymans lime limited company in Masaiti**"

I wish to inform you that following submission of your request to the Authority, our review of the same and in view of the ethical clearance, this study has been **approved** on condition that:

1. The relevant Provincial and District Medical Officers where the study is being conducted are fully appraised.
2. Progress updates are provided to NHRA bi-annually from the date of commencement of the study.
3. The final study report is cleared by the NHRA before any publication or dissemination within or outside the country.
4. After clearance for publication or dissemination by the NHRA, the final study report is shared with all relevant Provincial and District Directors of Health where the study was being conducted, University leadership, and all key respondents.

Yours sincerely,

National Health Research Authority

Prof Victor Chalwe,
Director and Chief Executive Officer

Appendix 6: Proposal Approval Letter

C/O Harvest University

Plot No. 9027, Buluwe Rd,

Woodlands

Lusaka

30th May, 2025

The Research Ethics Committee

University of Lusaka

Lusaka

Subject: Confirmation of Research Protocol Guidance and Completion:

Reference is made to the above captioned subject

I am writing to confirm that I have guided MALAMA CHISHA, ID No. **BSPH22112712** in the development of his dissertation titled 'Exploring **the impact of ergonomic practices on workers' performance and health at Handyman's Lime Limited Company in Masaiti District**

After reviewing the attached document, I attest that:

1. The student has received adequate guidance and supervision throughout the protocol development process.
2. The research protocol has been completed satisfactorily in line with University of Lusaka format and requirements.
3. The work is ready for submission to the University of Lusaka for the protocol evaluation purposes

I, therefore, recommend MALAMA CHISHA's research protocol for consideration and approval

Please feel free to contact me if you require any additional information.

Yours sincerely,

Tresford Sikazwe

RESEARCH SUERVISOR

Contact No. +260979674314