



doi:10.5281/zenodo.14780838

# Ergonomics In The Workplace And Preventing Musculoskeletal Disorder

<sup>1</sup>Amadi, Christy Chinyere & <sup>2</sup>Prof. Adedamola O Onyiaso

Department Of Health Promotion, Environmental and Safety Education

Faculty of Education

University of Port Harcourt, Port Harcourt, Nigeria

<sup>1</sup>[christyjustice4ever@gmail.com](mailto:christyjustice4ever@gmail.com)/+2348064001297

<sup>2</sup>[adedamola.onyiaso@gmail.com](mailto:adedamola.onyiaso@gmail.com)/+2348031189318

## ABSTRACT

In this case-study in the Faculty of Humanity, University of Port Harcourt, investigated musculoskeletal disorders (MSDs) which are a prevalent and costly issue in the workplace, resulting in discomfort, injury, and decreased productivity. This position paper will explore the principles of ergonomics and their application in preventing MSDs. We will discuss the risk factors for MSDs, including force, repetition, posture, vibration and examine strategies for prevention, such as engineering controls, administrative controls, and personal protective equipment (PPE). Best practices for workplace ergonomics will be presented, including workstation setup, task rotation, and employee training. Real-world examples and case studies will illustrate the impact of ergonomic interventions on MSD prevention. Participants will learn how to conduct an ergonomics assessment and implement changes to create a safer, more efficient work environment. By applying ergonomics principles, organizations can reduce the incidence of MSDs, improve employee well-being, and enhance overall performance.

**Keywords:** musculoskeletal disorders, ergonomics, Workplace

## INTRODUCTION

Ergonomics in the workplace plays a crucial role in preventing musculoskeletal disorders (MSDs) and promoting a safe and healthy work environment. MSDs are a leading cause of work-related injuries and illnesses, resulting in significant costs and lost productivity. By applying ergonomics principles, employers can reduce the risk of MSDs, improve employee comfort and performance, and enhance overall business efficiency.

According to the International Labour Organization (ILO), ergonomics is the science of fitting the workplace to the worker, not the worker to the workplace (ILO, 2019, p. 1). This approach recognizes the importance of designing tasks, workspaces, and equipment to match the capabilities and needs of workers.

University of Port Harcourt is one the prestigious university in Nigeria, is a federal university locate in Port Harcourt, Rivers State, Nigeria. It is established in 1975, Uniport has grown to become one of the largest and most respected universities in Nigeria.

The University of Port Harcourt is a reputable institution of higher learning in Nigeria, research and innovation. With its range of academic programs, research Centers and facilities, Uniport is an excellent choice for students, researchers and scholars.

The University of Port Harcourt has a large team of administrative workers who play a crucial role in the day-to-day operations of the university. These workers are responsible for providing support services to students, faculty and staff as well as managing the university administrative functions.

A case of back pain relating to musculoskeletal disorder which was dictated by a medical doctor was studied on one of the administrative staff in the faculty of humanity, an ergonomic chair was recommended.

### **Definition of concepts**

**Ergonomics:** is the science of fitting tasks, jobs, and environments to the capabilities and needs of people, with the goal of improving performance, safety, and well-being. It involves designing and arranging things to minimize stress and discomfort, and to maximize efficiency and productivity.

According to the International Ergonomics Association (IEA), ergonomics is defined as "the scientific discipline concerned with the understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data, and methods to design in order to optimize human well-being and overall system performance."

As stated by ergonomist, Evans (2019). Ergonomics is about creating a comfortable, safe, and efficient work environment that allows people to perform at their best, while also reducing the risk of injury and illness.

**Musculoskeletal:** Putz-Anderson, (2016). Musculoskeletal is relating to the muscles, bones, and their surrounding tissues, such as tendons and ligaments.

**Hazard:** Manuele, (2014). Hazard is a situation or condition that has the potential to cause harm, injury, or illness to people, damage to property, or harm to the environment.

**Workplace:** Gajendran and Harrison (2017). Workplace is a physical or virtual space where work is performed, including traditional offices, remote workplace and non-traditional work environments. Such as homes, coffee shops or co-working space' workplace can also be the physical and psychological environment in which an individual performs their job duties and responsibilities.

**Disorder:** World Health Organization (WHO). (2018). Defined disorder as a disruption or disturbance in the normal functioning of an individual's physical or mental health, resulting in impairment, distress, or risk of injury.

### **Risk factors for Musculoskeletal Disorders**

Here are some common risk factors for musculoskeletal disorders (MSDs):

1. Repetitive tasks: Performing the same task repeatedly, such as assembly line work or data entry.
2. Forceful exertions: Lifting, pushing, or pulling heavy objects, or using excessive force.
3. Awkward postures: Working in uncomfortable or unnatural positions, such as bending, twisting, or reaching.
4. Vibration: Exposure to vibrations from tools, machinery, or vehicles.
5. Prolonged sitting or standing: Remaining in a static position for extended periods.
6. Lifting heavy objects: Lifting, carrying, or moving heavy loads.
7. Poor ergonomics: Inadequate workspace design, inadequate lighting, or poor equipment design.
8. Previous injuries: History of musculoskeletal injuries or disorders.
9. Age: Older workers may be more susceptible to MSDs due to age-related changes.
10. Obesity: Excess weight can increase the risk of MSDs, particularly in the back and joints.
11. Prolonged computer use: Prolonged computer use can lead to MSDs in the neck, back, and upper extremities.
12. Manual handling: Manual handling of patients, residents, or clients in healthcare settings.
13. Vibration from mobile equipment: Exposure to vibrations from mobile equipment, such as forklifts or forklift trucks.
14. Working in cold environments: Working in cold temperatures can increase muscle stiffness and MSD risk.
15. Lack of exercise: Sedentary lifestyle or lack of regular exercise can contribute to MSDs.

It's important to note that many MSDs are caused by a combination of these risk factors, rather than a single factor.

**The principles of ergonomics in the workplace include:**

1. Fit: Designing tasks, jobs, and environments to fit the capabilities and needs of workers.
2. Comfort: Ensuring that workspaces and equipment are comfortable and do not cause discomfort or strain.
3. Efficiency: Optimizing workflows and processes to minimize waste and maximize productivity.
4. Safety: Identifying and mitigating hazards to prevent injuries and illnesses.
5. Accessibility: Ensuring that workspaces and equipment are accessible and usable by all workers.
6. Maintainability: Designing equipment and systems to be easy to maintain and repair.
7. Flexibility: Designing workspaces and equipment to accommodate different tasks and activities.
8. Adjustability: Ensuring that equipment and workspaces can be adjusted to fit individual workers' needs.

According Waldemar Karwowski (2006), these principles are essential for creating a safe, healthy, and productive work environment. By applying ergonomic principles, organizations can reduce the risk of injury, improve employee well-being, and enhance overall performance.

**There are three types of ergonomics in the workplace:**

1. Physical Ergonomics: Designing workspaces, equipment, and tasks to reduce physical discomfort, fatigue, and injury.
2. Cognitive Ergonomics: Designing systems, processes, and interfaces to reduce mental workload, stress, and error.
3. Organizational Ergonomics: Designing organizational structures, policies, and processes to promote employee well-being, productivity, and safety.

Peter Budnick (2017), these three types of ergonomics are interconnected and essential for creating a comprehensive ergonomics program in the workplace. By addressing physical, cognitive, and organizational factors, organizations can promote employee well-being, improve productivity, and reduce the risk of injury and illness.

**Common workplace ergonomics hazards include:**

1. Repetitive Strain Injuries\_ (RSI): Caused by repetitive tasks, forceful movements, and awkward postures.
2. Musculoskeletal Disorders (MSD): Caused by lifting, bending, and manual handling.
3. Poor Posture: Caused by inadequate seating, monitor placement, and workspace design.
4. Inadequate Lighting: Caused by insufficient or excessive lighting.
5. Noise Exposure: Caused by excessive noise levels.
6. Vibration Exposure: Caused by hand-arm vibration or whole-body vibration.
7. Workstation Design: Caused by inadequate or poorly designed workstations.
8. Task Design: Caused by poorly designed tasks, workflows, and processes.

David Caple (2018), these hazards can lead to discomfort, fatigue, injury, and illness if left unaddressed. Employers should identify and mitigate these hazards through ergonomic assessments, employee training, and workplace design changes.

**Strategies for preventing Musculoskeletal Disorders:**

**Engineering controls for musculoskeletal disorders (MSDs) include:**

1. Redesigning workstations and equipment to reduce awkward postures and forceful movements
2. Implementing ergonomic design principles for tools and equipment
3. Using mechanical aids to reduce manual handling and lifting
4. Installing safety devices to prevent accidents and injuries
5. Implementing computer-aided design and simulation to optimize workspaces
6. Using exoskeletons and wearable devices to reduce physical demands
7. Implementing autonomous systems to reduce repetitive tasks
8. Using virtual reality and augmented reality to enhance training and education

9. Implementing sensor technologies to monitor and reduce exposure to MSD risk factors

10. Designing workspaces to promote comfortable working postures and reduce fatigue

Waldemar Karwowski (2018), "Engineering controls are essential for preventing MSDs and can be used in conjunction with administrative controls and personal protective equipment to create a comprehensive MSD prevention program.

**Administrative controls for musculoskeletal disorders (MSDs) include:**

1. Rotating jobs or tasks to reduce repetition and awkward postures
2. Adjusting work schedules to allow for regular breaks and rest periods
3. Implementing training programs to educate workers on proper lifting techniques and body mechanics
4. Conducting regular safety meetings and MSD prevention training
5. Encouraging worker reporting of discomfort or pain
6. Implementing a formal MSD reporting and tracking system
7. Developing a written MSD prevention program
8. Providing resources for worker wellness and fitness
9. Encouraging open communication and feedback on MSD prevention
10. Regularly reviewing and updating the MSD prevention program

According to ergonomist, David Caple (2018), "Administrative controls are an essential component of a comprehensive MSD prevention program and can be used in conjunction with engineering controls and personal protective equipment to reduce the risk of MSDs.

**Personal protective equipment (PPE) controls for musculoskeletal disorders (MSDs) include:**

1. Wearing ergonomic gloves to reduce hand strain
2. Using back belts or supports to reduce lifting strain
3. Wearing comfortable, supportive shoes to reduce foot and leg strain
4. Using knee pads or cushions to reduce kneeling strain
5. Wearing elbow pads or supports to reduce elbow strain
6. Using wrist rests or supports to reduce wrist strain
7. Wearing ergonomic clothing or uniforms to reduce discomfort
8. Using personal fall protection equipment to reduce falls
9. Wearing anti-vibration gloves or tools to reduce vibration exposure
10. Using eye protection to reduce eye strain

According to Richard Graveling (2017), "PPE can be an effective control measure for reducing the risk of MSDs, but it should be used in conjunction with other controls, such as engineering and administrative controls, to create a comprehensive MSD prevention program.

By implementing all these preventive measures employees can; Reduce the risk of MSDs, improve worker comfort and productivity, enhance overall workplace safety and health. reduce workers' compensation claims and costs and improve compliance with regulatory requirements.

Implementing workplace ergonomics programs is a critical step towards creating a safe and healthy work environment. Employers, take the first step today by: Conducting a risk assessment to identify ergonomic hazards, developing a comprehensive ergonomics program, providing employee training and education, encouraging employee participation and feedback and regularly evaluating and improving your ergonomics program

By prioritizing workplace ergonomics, you can protect your employees, reduce the risk of MSDs, and promote a culture of safety and well-being. Remember, ergonomics is a long-term investment in your employees' health and your organization's success.

**Tips for engaging employees and management in ergonomics efforts:**

1. Communicate the benefits: Explain how ergonomics can improve worker comfort, productivity, and safety.
2. Involve employees in the process: Encourage employee participation in ergonomics assessments and solution implementation.

3. Provide training and education: Offer regular training sessions and workshops on ergonomics principles and best practices.
4. Make it a team effort: Encourage collaboration between employees, management, and safety professionals to identify and address ergonomics issues.
5. Recognize and reward participation: Acknowledge and reward employees for their involvement and suggestions in ergonomics efforts.
6. Lead by example: Demonstrate management's commitment to ergonomics by prioritizing and supporting ergonomics initiatives.
7. Celebrate successes: Share stories of ergonomics improvements and their positive impact on workers and the organization.
8. Continuously improve: Regularly solicit feedback and suggestions from employees to identify areas for further improvement.

According to Richard Graveling (2017), employee engagement and participation are essential for successful ergonomics initiatives. By involving employees in the process, organizations can tap into their knowledge and ideas, increasing the likelihood of successful implementation and sustainability.

Let's work together to create a healthier, safer, and more productive work environment for all. Implement workplace ergonomics programs today!

### **Success stories and lessons learned from implementing workplace ergonomics programs:**

According to National Safety Council. (2019). The following are success lesson learned from implementing workplace Ergonomics program.

1. Reduced injuries and illnesses: A manufacturing company implemented an ergonomics program, resulting in a 50% reduction in musculoskeletal disorders and a 25% reduction in workers' compensation claims. (Source: "Ergonomics Program Implementation" by the National Safety Council)
2. Improved productivity: A call center implemented an ergonomics program, resulting in a 20% increase in productivity and a 15% reduction in employee turnover. (Source: "Ergonomics in the Workplace" by the Occupational Safety and Health Administration)
3. Cost savings: A hospital implemented an ergonomics program, resulting in a \$200,000 reduction in workers' compensation claims and a \$150,000 reduction in medical costs. (Source: "Ergonomics Program Implementation" by the National Safety Council)
4. Employee engagement: A company implemented an ergonomics program, resulting in a 25% increase in employee satisfaction and a 20% increase in employee participation in safety initiatives. (Source: "Ergonomics in the Workplace" by the Occupational Safety and Health Administration)

### **Lessons learned**

1. Management commitment: Management support and commitment are crucial for a successful ergonomics program.
2. Employee involvement: Employee participation and feedback are essential for identifying and addressing ergonomic issues.
3. Training and education: Providing regular training and education on ergonomics principles and best practices is vital for employee understanding and engagement.
4. Continuous improvement: Regularly evaluating and updating the ergonomics program is necessary to ensure ongoing effectiveness and identify new areas for improvement.

### **CONCLUSION**

Ergonomics in the workplace plays a crucial role in preventing musculoskeletal disorders (MSDs) and promoting a safe and healthy work environment. By implementing workplace ergonomics programs, employers can reduce the risk of MSDs, improve employee comfort and productivity, and ultimately enhance overall business performance.

## SUGGESTIONS

Here are some suggestions for preventing musculoskeletal disorders in the workplace:

1. Use the right equipment: Use adjustable keyboard trays, vises, clamps, or jigs to stabilize objects.
2. Use a step stool or ladder: Use a step stool or ladder to reach above shoulder level or lift objects overhead.
3. Take breaks: Take frequent breaks to stretch and rest your hands.
4. Sit on ergonomic chair: An ergonomic office chair can help reduce strain on your back, neck, and shoulders.
5. Ergonomic training: Training can help employees learn how to reduce the risk of musculoskeletal disorders.

## REFERENCES

- Amick, B. C., III, & Robertson, M. M. (2019). *Office ergonomics: A review of the literature. Journal of Occupational Rehabilitation*, 29(2), 151-163. doi: 10.1007/s10926-018-9756-6
- Bruno Garza, J. L., & Brown, K. W. (2020). *Ergonomic interventions for preventing work-related musculoskeletal disorders of the upper limb and back. Cochrane Database of Systematic Reviews*, 2020(1), CD009873. doi: 10.1002/14651858.CD009873.pub3
- Caple, D. C. (2018). *Ergonomics: A Practical Guide to Workplace Design. Cengage Learning.*
- Chatterjee, D. S., & Barman, S. M. (2019). *Musculoskeletal disorders and ergonomic risk factors in information technology professionals. Journal of Occupational Health*, 61(2), 241-248. doi: 10.1002/1348-9585.12043
- Dul, J., & Neumann, W. P. (2018). *Ergonomics and musculoskeletal disorders: A systematic review.*
- Evans, D. C. (2019). *Ergonomics: A Practical Guide to Workplace Design. CRC Press.*
- Gerr, F., & Kleinbaum, D. G. (2018). *The association between ergonomic exposures and upper extremity musculoskeletal disorders. Journal of Occupational and Environmental Medicine*, 60(5), 449-455. doi: 10.1097/JOM.0000000000001273
- Graveling, R. (2017). *Occupational Ergonomics: A Practical Approach. CRC Press.*
- International Journal of Industrial Ergonomics*, 66, 273-284. doi: 10.1016/j.ergon.2018.04.007
- Karwowski, W. (2006). *International Encyclopedia of Ergonomics and Human Factors. CRC Press.*