

## Analysis of WMSDs Among Network Division Employees at PT. XYZ Using the Nordic Body Map and ROSA Methods

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**Abstract:** *Intensive computer use without ergonomic considerations poses risks of Work-Related Musculoskeletal Disorders (WMSDs) for PT. XYZ employees, who often work in uncomfortable positions. This study identified risk factors using the Nordic Body Map and ROSA methods. Results revealed high complaints in the upper neck and right shoulder, with 4 out of 5 employees at high risk due to non-ergonomic work postures and facilities. Recommendations include workplace layout improvements, posture training, and stretching routines to reduce WMSD risks and enhance employee well-being.*

**Keywords:** *WMSDs, Nordic Body Map, ROSA, Ergonomic*

### 1. INTRODUCTION

In contemporary office environments, the pervasive use of computers as primary tools for work activities precipitates numerous ergonomic concerns that pose risks to employees. Prolonged computer use without consideration of ergonomic principles can result in musculoskeletal discomfort, encompassing symptoms such as back pain, neck stiffness, and muscle strain. Recurring complaints attributed to excessive computer usage are often occasioned by inadequate facilities, suboptimal workplace layouts, or a combination of various factors.

PT. XYZ is an electricity company operating in the service and distribution sectors within the Sidoarjo region, East Java. The company manages electricity distribution for a wide range of customers, from small-scale users to large-scale consumers. In PT. XYZ there are several divisions or sections, including finance, network, construction, trade, and marketing, electricity transactions, K3L and KAM, and procurement, employs individuals who frequently engage in computer-intensive work activities. Notably, network section personnel exhibit a propensity for prolonged work periods in uncomfortable postures, often driven by entrenched work habits or lack of supportive amenities. This behavior poses a significant risk of Work-Related Musculoskeletal Disorders (WMSDs), a condition necessitating prompt intervention to mitigate its severe consequences.

According to (Suarjana et al., 2024) the Musculoskeletal Disorders (MSDs), often referred to as Work-Related Musculoskeletal Disorders (WMSDs) in occupational settings, have emerged as a significant concern across diverse work environments globally. These

disorders pertain to dysfunctions affecting the musculoskeletal system, encompassing muscles, tendons, ligaments, and bones. In recent years, there has been a growing focus on WMSDs due to their adverse effects on employee health and overall workplace productivity.

To address this, the study employs the Nordic Body Map to assess physical discomfort in various body parts and the ROSA method to evaluate ergonomic risks in the workplace. The primary goals are to identify employee complaints, analyze WMSD risks, and propose improvements to work postures and facilities to enhance employee health and productivity.

## **2. LITERATURE REVIEW**

### **WMSDs**

Musculoskeletal complaints refer to discomfort or pain experienced in the skeletal muscles, ranging from mild to severe. Repeated and prolonged exposure to static loads on the muscles can lead to issues such as joint, ligament, and tendon damage. These problems are commonly known as musculoskeletal disorders (MSDs) (Tarwaka et al., 2004). Work-related musculoskeletal disorders are an important public health problem in the working environment which may affect one or more of the following: neck, shoulder, elbow, wrist, hand, upper back, low back, hip, knee, ankle, and foot (Kibret et al., 2020). These disorders are increasingly acknowledged as a major contributor to human suffering, reduced productivity, and economic losses for society (Lop et al., 2017). Around 25–27% of European workers report experiencing back pain, while 23% suffer from muscle pain. Additionally, 62% of workers in the EU-27 are frequently exposed to repetitive hand and arm movements, 46% endure painful or fatiguing postures, and 35% are involved in tasks that require lifting or moving heavy loads (Wardani et al., 2023). In 2018, the prevalence of musculoskeletal diseases in Indonesia, as diagnosed by doctors, was recorded at 7.3% (Putri et al., 2023). Addressing WMSDs requires a comprehensive strategy to prevent and manage these injuries, ensuring a safe and healthy work environment for everyone (Kim, 2023).

### **Nordic Body Map**

The Nordic Body Map (NBM) is a straightforward questionnaire designed to identify ergonomic risks. It is one of the most commonly used ergonomic checklists to assess and pinpoint areas of discomfort experienced by workers (Zahra & Prastawa, 2023). The NBM is designed to provide detailed information about specific body parts that experience discomfort or pain during work (Dewi, 2020). The Nordic Body Map (NBM) questionnaire divides the body into 28 sections and uses a 4-point Likert scale to assess discomfort levels: no pain, slight pain, moderate pain, and severe pain (Sholehah et al., 2022). The Nordic Body Map is used to

evaluate musculoskeletal disorders (MSDs) alongside several closed-ended questions about activities performed during work (Pristianto & Mawarni, 2024).

### **Rapid Office Strain Assessment (ROSA)**

The Rapid Office Strain Assessment (ROSA) is a paper-based checklist designed to quickly evaluate whether an office workstation needs further assessment or intervention (Sonne & Andrews, 2011). This method is based on the CSA standards for Office Ergonomics (CSA-Z412), with musculoskeletal risk factors identified through extensive research focused on office and computer work. The tool organizes these risk factors into several categories, such as chair, monitor, telephone, and mouse and keyboard (Matos & Arezes, 2015).

Each category of risk factors is further influenced by a duration score, which indicates the impact of each element of the work environment. The evaluation of each factor is assigned a score ranging from 1 to 10 (Restuputri et al., 2019). If the final value exceeds 5, it is classified as high risk, requiring additional evaluation at the relevant workplace (Simanjuntak & Susanto, 2022). The ROSA method was selected due to its simplicity and suitability for complex office environments, addressing factors such as posture, lighting, and workstation interactions (Wijaya & Syakhroni, 2023).

## **3. METHODS**

### **Data Collection Techniques**

The research employs a quantitative approach, concentrating on the collection and analysis of data to address a specific issue. The focus of this study is on the work posture of five employees from the PT. XYZ network division. Conducted at PT. XYZ, the research took place over a month, from October 1 to October 31, 2024. The data collection process involved the following steps:

- a. **Questionnaire Distribution:** This phase involved gathering data through the distribution of NBM questionnaires to employees to find out the muscle complaints of employees of the PT. XYZ network division.
- b. **Observation:** This method involved collecting data through direct observation in the field, specifically examining the work posture of employees in the PT. XYZ network division using the Rapid Office Strain Assessment (ROSA) worksheet.

## Data Processing Stage

The data processing phase involves analyzing the information gathered from observations and questionnaire responses. The collected data includes:

1. Nordic Body Map questionnaire data
2. ROSA observation data (which consists of Assessment of Body Posture Score Section A, Section B, and Section C)

The processing of NBM questionnaire data entails editing, inputting, and presenting the information in tables and narrative form. For the ROSA worksheet data, the process involves calculating the scores for each section using an assessment matrix, determining the final ROSA score, and evaluating the associated risk level and its management.

## 4. RESULTS AND DISCUSSION

### Nordic Body Map Questionnaire Results

The data collected from the NBM questionnaire administered to five employees reveals that the respondents do not share identical complaints. Below are the findings from the NBM data collection regarding the employees.

**Table 1.** Nordic Body Map Recapitulation Results

No	Complaint	Employee Score					Total	Percentage
		A	B	C	D	E		
0	Upper neck pain	2	1	2	1	2	8	4.00%
1	Lower neck pain	2	1	2	2	2	9	4.50%
2	Left shoulder pain	2	1	2	2	1	8	4.00%
3	Right shoulder pain	2	1	2	2	2	9	4.50%
4	Left upper arm pain	2	1	2	1	2	8	4.00%
5	Back pain	2	1	2	1	2	8	4.00%
6	Right upper arm pain	2	1	2	1	2	8	4.00%
7	Waist pain	2	1	2	1	2	8	4.00%
8	Buttock pain	2	1	1	1	2	7	3.50%
9	Bottom pain	2	1	1	1	1	6	3.00%
10	Left elbow pain	2	1	1	1	1	6	3.00%
11	Right elbow pain	2	1	1	1	1	6	3.00%
12	Left lower arm pain	2	1	1	1	1	6	3.00%
13	Right lower arm pain	2	1	2	1	2	8	4.00%
14	Left wrist pain	2	1	1	1	1	6	3.00%
15	Right wrist pain	2	1	1	1	1	6	3.00%
16	Left hand pain	2	1	1	1	1	6	3.00%
17	Right hand pain	2	1	1	1	2	7	3.50%
18	Left thigh pain	2	2	1	1	1	7	3.50%
19	Right thigh pain	2	2	1	1	1	7	3.50%
20	Left knee pain	2	1	3	1	1	8	4.00%
21	Right knee pain	2	1	1	1	1	6	3.00%
22	Left calf pain	2	1	1	2	1	7	3.50%
23	Right calf pain	2	1	1	2	1	7	3.50%
24	Left ankle pain	2	1	2	1	1	7	3.50%
25	Right ankle pain	2	1	2	1	1	7	3.50%
26	Left foot pain	2	2	1	1	1	7	3.50%
27	Right foot pain	2	2	1	1	1	7	3.50%
	Total	56	32	41	33	38	200	100.00%

To gain a deeper understanding of the complaints and risk levels faced by each employee, the following presents the results of the data analysis.

**Table 2.** Nordic Body Map Total Score

No	Nama	Total Individual Score	Risk Level
1	Employee A	56	Medium
2	Employee B	32	Low
3	Employee C	41	Low
4	Employee D	33	Low
5	Employee E	38	Low

The data presented above indicates the risk levels of WMSDs among employees in the PT. XYZ network department. According to the scores, Employee A has a moderate risk level with a total score of 56, suggesting that future action may be necessary. In contrast, Employees B, C, D, and E have low risk levels, with total scores of 32, 41, 33, and 38, respectively, indicating that no corrective measures are required. Additionally, the most frequently reported complaints among employees are related to the lower neck and right shoulder, each accounting for 4.50% of the total complaints.

### ROSA Method Analysis

The ergonomic assessment using the ROSA method is a risk evaluation approach for tasks performed in an office environment that utilizes computer equipment. The identification of risk factors associated with computer use is based on several components, including chairs, monitors, telephones, mouse, and keyboards. Each of these risk factors is assigned a value between 1 and 3. The overall ROSA score is derived from a range of 1 to 10. The evaluation of workload risk using the ROSA method for five employees in the PT. XYZ network is categorized into three sections, as detailed below.

**Table 3.** ROSA Final Score

No	Name	Sitting duration	Chair score	Monitor & Telephone score	Mouse & Keyboard score	Peripherals & Monitor score	ROSA score	Category
1	Employee A	>4 hours/day	4	2	5	5	5	High Risk
2	Employee B	>4 hours/day	4	2	3	3	4	Medium Risk
3	Employee C	>4 hours/day	5	2	3	3	5	High Risk
4	Employee D	>4 hours/day	5	3	3	3	5	High Risk
5	Employee E	>4 hours/day	5	4	5	5	5	High Risk

The final score range for ergonomic risk assessment using the ROSA method is between 1 and 10. A score of 1 to 5 indicates that the employee is at low to medium risk, suggesting that no immediate changes are necessary. A score between 5 and 7 falls into the high-risk category, indicating that improvements to the work environment are required. Conversely, a score of 8 to 10 is classified as very high risk, recommending that enhancements to the work environment be implemented without delay (Wicaksono et al., 2024).

According to the ROSA score calculations, four out of five employees—Employee A, Employee C, Employee D, and Employee E—each received a score of 5, indicating that their work postures are at high risk and require further analysis and immediate improvements in work posture, facilities, and habits. In contrast, Employee B scored 4, suggesting a moderate risk level that may also necessitate improvements.

In Section A, it is noted that three out of five employees are at high risk with a score of 5, while the remaining two are at moderate risk with a score of 4. This situation arises from inadequate chair depth, hard armrests that are not height-adjustable, and chairs that are set too high. These factors can lead to discomfort and complaints in body areas susceptible to musculoskeletal disorders (MSDs), with both activities lasting over four hour each day.

In Section B, all employees received low to moderate scores, with three employees scoring 2, one employee scoring 3, and another scoring 4. The monitors used by all employees are positioned correctly at a distance of 40-75 cm from their eyes. Regarding telephone use, all employees pick up the phone with one hand while maintaining a neutral neck position; however, one employee tends to place the phone between their neck and shoulder during long calls, which could lead to discomfort and potential MSD complaints. The duration of these activities also exceeds four hour each day.

In Section C, all employees received moderate to high scores, with three employees scoring 3 and two employees scoring 5. The mouse are positioned correctly, parallel to the shoulders and on the same surface as the keyboard. However, all employees have a habit of holding the mouse and typing with bent wrists, which may lead to discomfort and potential MSD complaints. Again, the duration of these activities is over four hour each day.

## **5. CONCLUSION AND SUGGESTIONS**

### **Conclusion**

The research carried out at PT. XYZ reveals considerable ergonomic hazards encountered by employees as a result of extended computer usage without adequate ergonomic measures. Results from the Nordic Body Map and Rapid Office Strain Assessment (ROSA) methods show that a significant number of employees are at risk of developing Work-Related Musculoskeletal Disorders (WMSDs), especially in the upper neck and right shoulder regions. Employee A was found to have a moderate risk level, while the remaining employees showed low risk levels. Nevertheless, the ROSA evaluation indicated that four out of five employees are at high risk due to poor work postures and insufficient facilities. This highlights the critical need for interventions aimed at enhancing workplace ergonomics, improving employee health, and decreasing the chances of musculoskeletal disorders.

### **Suggestions**

Suggestions for the company to redesign workstations to ensure they are ergonomically sound. This includes providing adjustable chairs that support the lower back, desks that can accommodate both sitting and standing positions, and monitor stands that allow screens to be at eye level. This will help employees maintain a neutral posture and reduce strain on their necks and backs. And Conduct regular training sessions on ergonomic practices to educate employees about maintaining proper posture at work, adjusting their workstations correctly, and using techniques to minimize strain during computer use.

Suggestions for next study so they can conduct a longitudinal study to assess the long-term effects of ergonomic interventions implemented at PT. XYZ. This study could track changes in employee discomfort, productivity, and overall health over time, providing valuable insights into the effectiveness of ergonomic improvements. Also to perform a comparative analysis of ergonomic risks and WMSDs across different departments within PT. XYZ or similar organizations. This could help identify specific areas or job roles that are more susceptible to ergonomic issues, allowing for targeted interventions.

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