Jurnal Teknik Industri: Jurnal Hasil Penelitian dan Karya Ilmiah dalam Bidang Teknik Industri

Vol. 10, No. 2, 2024

Analysis Of Work Posture Using the Rapid Office Strain Assessment (ROSA) And Rapid Upper Limb Assessment (RULA) Methods in Office Administration Employees

(Study Case: PT. Karya Sidorukun Santosa)

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ABSTRACT

The widespread use of computers in modern office environments has made them indispensable tools for daily tasks. However, prolonged sitting and computer operation without consideration of ergonomic principles pose significant health risks to employees, potentially affecting their well-being and productivity over time. An initial assessment using the Cornell Musculoskeletal Discomfort Questionnaire (CMDQ) among office administration staff at PT Karya Sidorukun Santosa revealed common complaints, including headaches, neck tension, back pain, and difficulties in concentration. This study aimed to evaluate ergonomic risks among these employees using the Rapid Upper Limb Assessment (RULA) and Rapid Office Strain Assessment (ROSA) methods. The RULA analysis indicated that 50% of employees required further investigation (score 4), 33.3% required immediate corrective actions (score 5), and 16.7% needed urgent intervention (score 7). The ROSA scores ranged from 4 to 7, underscoring the necessity of upgrading office facilities and optimizing workspace layouts to mitigate the risk of musculoskeletal disorders. These ergonomic interventions enhance employee comfort and productivity in office settings.

Keywords: *Ergonomics, RULA, ROSA, Administrative Employees.*

Introduction

Administrative activities are crucial in various industrial sectors, both manufacturing and services, including PT. These activities include human resource management, data recording, and information organization that supports the company's smooth operation. In the modern era, computers have become a key tool in office activities, allowing for efficiency and effectiveness in completing tasks.

The Rapid Office Strain Assessment (ROSA) is designed to measure the risks associated with computer work quickly and to establish a level of action for changes based on worker discomfort reports. ROSA has proven to be an effective and reliable method for identifying discomfort-related computer use risk factors [1]–[4]. A company in Indonesia engaged in inspection, supervision, testing, and review. The company's diversity is packaged in an integrated manner, with a network of laboratories, branches and service points in various cities in Indonesia and supported by 2,646 professionals who are experts in their fields. Based on the company's field of work, it is necessary to analyze the work posture for the Office, Laboratory, and Ship areas (Density Measurement and Oil Sampling) so that MSD (Musculoskeletal Disorder) does not occur in the form of damage to joints, ligaments, and tendons in workers using the REBA and RULA methods.

ROSA and RULA are methods used to analyze work posture and risks associated with computer or upper limb use[5]–[8]: ROSA: The office ergonomics method measures the risks associated with computer use [1], [9]–[11]. Its final value is used to determine the level of change action based on worker discomfort reports. RULA, the Rapid Upper Limb Assessment method, is used to assess the upper body's working posture and calculate the level of Musculoskeletal Disorders (MSDs) load on work that is risky for the upper limbs.

While the increased interaction between humans and computers provides significant benefits, the negative impact on employee health cannot be ignored. Employees who spend long periods sitting and operating a computer are at risk of various health problems, especially when they do not pay attention to ergonomics while working. Employee health is essential to ensure the sustainability and productivity of the company.

One of the common health problems is musculoskeletal disorders (MSDs). Activities performed in an unergonomic position can result in joint injuries and excessive muscle load, especially if the work is performed in a static state for a long time [10], [12], [13]. Poor work positions can lead to fatigue, decreased concentration, and reduced accuracy, ultimately negatively impacting employee productivity and slowing the work process.

PT. Karya Sidorukun Santosa is a private company engaged in the supply of outsourced labour, security personnel (security), construction, cleaning, garden maintenance, temporary and wholesale labour and several construction and civil works in several large companies in the Gresik Regency area. At PT Karya Sidorukun Santosa, the organizational structure includes the Director, HRD, and Admin Staff who work in the office environment without going to the field.

Office administration employees or commonly referred to as admin staff, are responsible for managing labor needs, recording attendance, and completing various administrative tasks for about 8 hours every day. Although the office facilities are adequate, many employees do not pay attention to ergonomics. A work position that they consider comfortable can lead to serious health problems. The results of interviews with several employees showed complaints such as headaches, neck tension, back pain, and difficulty concentrating.

Against this background, this study was conducted to analyze the work posture of administrative employees at PT Karya Sidorukun Santosa, which is not by the ergonomic aspect and knowing the level of danger risk caused, using the Rapid Upper Limb Assessment (RULA) method to analyze ergonomic risks in the upper body and Rapid Office Strain Assessment (ROSA) to analyze the bodywork posture in the office scope

Research Methods

This study uses an observational descriptive approach and was conducted at PT. The respondents were determined comprehensively from employees assessed for their posture by the administration department who served at PT. Karya Sidorukun Santosa.

This research is conducted among PT office Administration Employees, and the sample consists of 6 employees. Karya Sidorukun Santosa. The data was collected by direct observation and question and answer with 6 members of administrative staff involved in PT. Karya Sidorukun Santosa. The results of pain complaints from work experienced by distributing the Cornell Musculoskeletal Discomfort Questionnaire (CMDQ) questionnaire were obtained from the data collection. Employee work posture assessment uses two methods: Rapid Upper Limb Assessment (RULA) and Rapid Office Strain Assessment (ROSA). RULA assesses the posture, style, and movement of a work activity related to using the upper limbs.

An ergonomic method that assesses upper body posture, style, and movement while working. RULA calculates the Musculoskeletal Disorders (MSDs) load on the operator's body parts, from the neck to the abdomen. An office risk assessment tool assesses posture and risk factors for using work peripherals, such as mice, monitors, and keyboards. ROSA is used to identify ergonomic hazards in the office and establish change actions based on worker discomfort reports. The next data collection method uses a camera to take pictures of work activities to identify the employees' body posture using the Rapid Office Strain Assessment (ROSA) method. Primary data was obtained from direct observation, structured interviews, and documentation data collection, and secondary data was obtained from document review

Results and Discussion

Work Posture Assessment Using the Rapid Office Strain Assessment (ROSA) Method

The assessment was carried out on 6 employees of the administration department at PT. Sidorukun Santosa's work, applying the ROSA method, uses photos taken while they are carrying out their work tasks. After that, the images were evaluated and analyzed.

Figure 1. Work posture of Production Section Administration Employees 1

According to the opinion [14]) The determination technique can be carried out with a population of less than 30 people on the condition that all existing populations are involved. Regarding the results of the journal [15], it is stated that many researchers use a very small minimum sample size, namely 3-5 people.

Table 1. ROSA Assessment Part A

No	Variable	Shoes	Information
1	Seat height	2	As can be seen in the picture, the chair is so low that the knees form a <90-degree angle. And there is an addition (+1) because the legs are not free
2	Seat depth	2	It can be seen in the picture that the seat is too narrow
3	Armrests		It can be seen in the picture of the hand not resting on the chair. However, there was an increase in the score (+1) because the height of the seat support could not be adjusted. And (+1) because the support is too hard.
4	Backrest	2	It can be seen in the picture of the position of the admin staff leaning in front

To find out the score value in table part A, calculate the value (seat height + seat depth) 2(+1) + 2 = 5 (armrest + backrest) ((+1) + (+1)) + 2 = 4.

Table 2. ROSA Score Part A

		SECTION A SCORE							
		Arm Rest and Back Support							
		2	3	4	5	6	7	8	9
seat pan bright/depth	2	2	2	3	4	5	6	7	8
	3	2	2	3	4	5	6	7	8
	4	3	3	3	4	5	6	7	8
	5	4	4	4	4	5	6	7	8
	6	5	5	5	5	6	7	8	9
	7	6	6	6	7	7	8	8	9
	8	7	7	7	8	8	9	9	9

The score obtained from Table A is 4, which is then added to the score of the length of time used to obtain the total value of the seats. If the admin staff's work is carried out continuously, > 4 hours/day, then a value (+1) is added to the total score of part A. The value obtained from the total score of part A is 4 plus the duration score (+1), so the total value of seats is 4 + 1 = 5.

Table 3. ROSA Assessment Part B

No	Variable	Shoes	Information
1	Monitor position	2	It can be seen in 1 that the position of the monitor is too low, and the addition of (+1) calculated that the distance of the monitor is too far
2	Phone Position	2	The distance between workers and the phone is too far

The value in section B is determined by adding the score obtained by the duration of use. Because the duration of use is> 4 hours/day, the score obtained is added (+1). (monitor score + duration) 2 + 1 = 3, (phone score + duration) 2 + 1 = 3.

After obtaining the results, they are then entered into the table of part B.

Table 4. ROSA Score Part B

		SECTION B SCORE							
		Monitor							
		0	1	2	3	4	5	6	7
Phone	0	1	1	1	2	3	4	5	6
	1	1	1	2	2	3	4	5	6
	2	1	2	2	3	3	4	6	7
	3	2	2	3	3	4	5	6	8
	4	3	3	4	4	5	6	7	8
	5	4	4	5	5	6	7	8	9
	6	5	5	6	7	8	8	9	9

Based on the table of part B, the scores obtained are, 3.

Table 5. ROSA Assessment Part C

No	Variable	Shoes	Information
1	Mouse Position	1	It can be seen in figure 1 the position of the mouse parallel to the hand
2	Keyboard position	1	Straight shoulder arm swing relaxed with an addition (+1) due to deviation (tilt)

To find out the score value in part C by adding the score obtained by the duration of use. Because the duration of use > 4 hours/day, the score obtained is added (+1). (mouse score + duration) 1 + 1 = 2, (keyboard score + duration) 1 (+1) + 1 = 3. After obtaining the results, they are entered into the table of part C.

Table 6. ROSA score part C

		SECTION C SCORE							
		Keyboard							
		0	1	2	3	4	5	6	7
Mouse	0	1	1	1	2	3	4	5	6
	1	1	1	2	2	4	5	6	7
	2	1	2	2	3	4	5	6	7
	3	2	3	3	3	5	6	7	8
	4	3	4	4	5	5	6	7	8
	5	4	5	5	6	6	7	8	9
	6	5	6	6	7	7	8	8	9
	7	6	7	7	8	8	9	9	9

Based on the table of part C, the scores obtained are 3.

After obtaining the B table values from the monitor and phone scores, which totalled 3, and the C table values for the mouse and keyboard scores, which also totalled 3, the next step was to find the scores for the monitors and peripherals.

Table 7. Monitor & peripheral scores

	Monitor And Peripherals Score								
	Mouse and Keyboard								
	1	2	3	4	5	6	7	8	9

Monitor and Telephone										
	1	1	2	3	4	5	6	7	8	9
	2	2	2	3	4	5	6	7	8	9
	3	3	3	3	4	5	6	7	8	9
	4	4	4	4	4	5	6	7	8	9
	5	5	5	5	5	5	6	7	8	9
	6	6	6	6	6	6	6	7	8	9
	7	7	7	7	7	7	7	7	8	9
	8	8	8	8	8	8	8	8	8	9
	9	9	9	9	9	9	9	9	9	9

Based on the table above, the monitor and peripheral scores were obtained with a value of 3.

Final Determination of ROSA Method Score

To find the final score, the ROSA method score was obtained from the monitor and peripheral score, which was 3 and the seat score in part A, which was 5.

Table 8. Final score of ROSA

		Peripherals and Monitor								
		1	2	3	4	5	6	7	8	9
Chair	1	1	2	3	4	5	6	7	8	9
	2	2	2	3	4	5	6	7	8	9
	3	3	3	3	4	5	6	7	8	9
	4	4	4	4	4	5	6	7	8	9
	5	5	5	5	5	5	6	7	8	9
	6	6	6	6	6	6	6	7	8	9
	7	7	7	7	7	7	7	7	8	9
	8	8	8	8	8	8	8	8	8	9
	9	9	9	9	9	9	9	9	9	9
				Rosa Final Score					5	

Therefore, the final score of the ROSA method for admin worker 1 obtained a final score of 5. The results of the ROSA score assessment will be divided based on the level of ergonomic risk: low-risk level with a score of 1-2, medium-risk level with a score of 3-4, high-risk level with a score of 5-7, and very high-risk level with a score of 8-10. Thus, the final score of the ROSA method for admin worker 1 falls into the high-risk category.

Work Posture Assessment Using the Rapid Upper Limb Assessment (RULA) Method

The next stage is to process data using the RULA method based on the results of collecting data on the documentation of employees' body postures. The documentation can be seen in the following image.

a. **Upper Arm:** The angle between the upper arm and the vertical 0° angle to the position of the worker's upper arm is assessed.

Figure 2. Upper Arm Angle

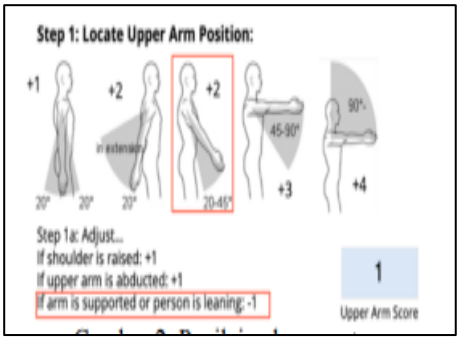

Figure 3. Upper Arm Assessment

After the angle of bending of the upper arm to the body is known, the assessment is carried out based on the category contained in the RULA form

b. Forearm: The angle between the forearm and the vertical 0° angle to the position of the worker's forearm is assessed**.**

Figure 4*. Forearm Angle*

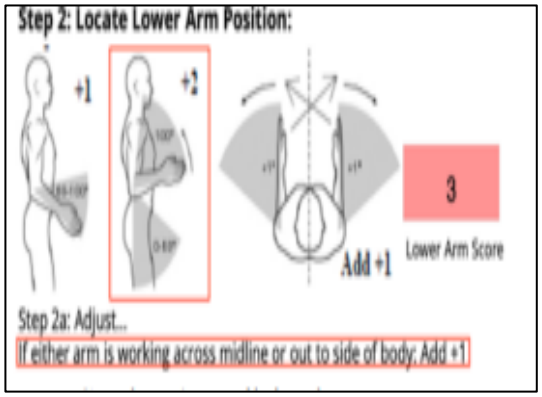

Figure 5. Forearm Assessment

After the angle of the bend of the forearm to the upper arm is known, the assessment is carried out based on the category contained in the RULA form

c. **Wrist:** Assessment is carried out on the angle between the wrist and forearm of the worker.

Figure 6. Wrist Angle

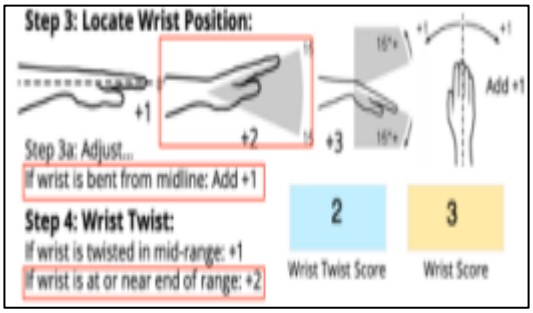

Figure 7. Wrist Assessment

d. Table A: After getting the score on all postures in part A, the score is entered into the table to get part A points, which can be seen in Table 9:

Table 9. The assessment of the AS Table scored 3 points in the posture of part A

SCORES									
		Table A: Wrist Posture Score							
		1		2		3		4	
Lower Arm	Upper Arm	Wrist Twist	Wrist Twist	Wrist Twist	Wrist Twist	Wrist Twist	Wrist Twist	Wrist Twist	Wrist Twist
		1	2	1	2	1	2	1	2
1	1	1	2	2	2	2	3	3	3
	2	2	2	2	2	3	3	3	3
	3	2	3	3	3	3	3	4	4
2	1	2	3	3	3	3	4	4	4
	2	3	3	3	3	3	4	4	4
	3	3	4	4	4	4	4	5	5
3	1	3	3	4	4	4	4	5	5
	2	3	4	4	4	4	4	5	5
	3	4	4	4	4	4	5	5	5
4	1	4	4	4	4	4	5	5	5

	2	4	4	4	4	4	5	5	5
	3	4	4	4	5	5	5	6	6
5	1	5	5	5	5	5	6	6	7
	2	5	6	6	6	6	7	7	7
	3	6	6	6	7	7	7	7	8
6	1	7	7	7	7	7	8	8	9
	2	8	8	8	8	8	9	9	9
	3	9	9	9	9	9	9	9	9

e. Wrist and Arm Score: Furthermore, the score obtained in part A is calculated by adding additional points for the use of muscles and significant force or weight so that the Wrist and Arm score for employees is found to be 4 points.

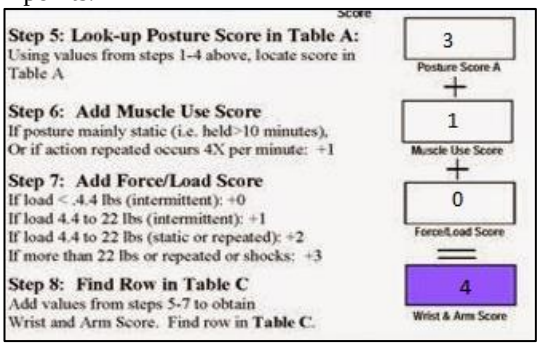

Figure 8. Wrist and Arm Score

f. Neck: Assessment is carried out on the angle of neck bend and the vertical angle of 0° to the position of the worker's neck.

Figure 9. Neck Angle

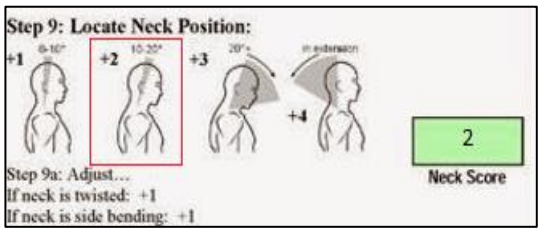

Figure 10. Neck Assessment

After the angle of the neck bend to the body is known, the assessment is based on the category in the RULA form

g. Back: Assessment is carried out on the angle of back bending (torso) and the vertical angle of 0° to the position of the worker's back.

Figure 11. Neck Assessment

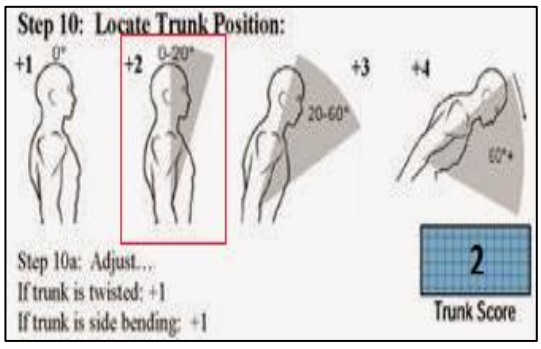

Figure 12. Back Assessment

After the angle of the backbend is known, the assessment is based on the category in the RULA form

h. Feet: Assessment is carried out on the position of the feet (whether the feet are well concentrated or not).

Figure 13. Foot Position

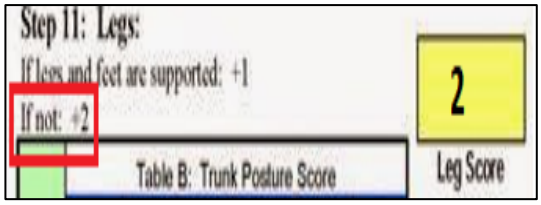

Figure 14. Foot Position

After the stability of the foot position is known, the assessment is carried out based on the category contained in the RULA form

i. Table B **:** After getting all the postures in section B, the score is entered into the table to get part B points as follows:

Table 10. Assessment of Table B

Neck Posture Score	Table B : Trunk Posture Score											
	1		2		3		4		5		6	
	Legs		Legs		Legs		Legs		Legs		Legs	
	1	2	1	2	1	2	1	2	1	2	1	2
1	1	3	2	3	3	4	5	5	6	6	7	7
2	2	3	2	3	4	5	5	5	6	7	7	7
3	3	3	3	4	4	5	5	6	6	7	7	7
4	5	5	5	6	6	7	7	7	7	7	8	8
5	7	7	7	7	7	8	8	8	8	8	8	8
6	8	8	8	8	8	8	8	9	9	9	9	9

So that a score of 3 points was obtained in the posture of part B.

j. Neck, Trunk, and Leg Score: Furthermore, the score obtained in part B is calculated by adding additional points for the use of muscles and significant force or weight, so that the Neck, Trunk, and Leg score for employees is 4 points.

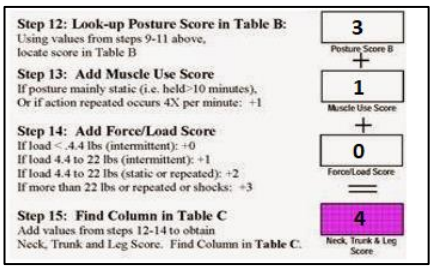

Figure 15. Neck, Trunk, and Leg Scores

k. RULA Final Score: After it is known that the Wrist and Arm points are 4 points and the Neck, Trunk, and Leg points are 4 points, the data is entered into Table C to get the RULA score on the assessed workers.

Table 11. Assessment of Table C (RULA Score)

Wrist and Arm Score	Table C: Neck, Trunk and Leg Score						
	1	2	3	4	5	6	7+
1	1	2	3	3	4	5	5
2	2	2	3	4	4	5	5
3	3	3	3	4	4	5	6
4	3	3	3	4	5	6	6
5	4	4	4	5	6	7	7
6	4	4	5	6	6	7	7
7	5	5	6	6	7	7	7
8+	5	5	6	7	7	7	7

Scoring: (Final Score from Table C)

1 or 2 = acceptable posture
3 or 4 = further investigation. Change may be needed
5 or 6 = further investigation, change soon
7 = investigate and implement change

4

Final Score

l. RULA Score: Employee 1's assessment shows a score of 4, which indicates the need for further investigation and a change of position according to the employee's needs.

Discussion

1. Results of the Rapid Office Strain Assessment (ROSA) Method

The final score of the ROSA method recapitulation from the data processing of 6 admin staff workers at PT. Sidorukun Santosa's work can be seen in Table 12.

Table 12. Final score of ROSA recapitulation

Department	Score A	Score B	Score C	Monitor and Peripherals	Final Score ROSA	Risk Category
Admin Staff Production 1	5	3	3	3	5	High Risk
Admin Staff Production 2	6	3	4	4	6	High Risk
Staff Admin PPE	7	3	5	5	7	High Risk
Billing Admin Staff	5	4	5	3	6	High Risk
Staff Admin ID Card	4	2	3	3	4	Medium Risk
BPJS Admin Staff	5	3	3	5	5	High Risk

The final value of the ROSA method ranges from 1-5. A final grade between 1-5 indicates that the work is low or medium risk and does not require immediate repairs.

A final score between 5 and 7 indicates the job is high-risk and requires workstation repairs. A final score above 8 indicates that the work is very high and needs to be improved immediately [16]–[19].

From the risk assessment results on 6 samples of office admin staff of PT. Sidorukun Santosa's work, based on the ROSA score recapitulation table above, obtained a score range of 4 to 7. It can be seen that the admin staff of the production section 1 with a final score of 5, the admin staff of the production section 2 with a final score of 6, the admin staff of the PPE section with a final score of 7, the admin staff of the billing section with a final score of 6, the admin staff of the ID Card section with a final score of 4, and the admin staff of the BPJS section with a final score of 5. From the 6 recapitulation results above, the PPE admin staff who got the final score with the highest score of 7 with the highest problem was in the chair used. The final score obtained was included in the high-risk category, meaning improvements to the facilities used and the workspace layout are needed. Meanwhile, the ID Card admin staff with the lowest final score of 4, is included in the medium risk category, which means there is no need to make immediate improvements.

2. Results of the Rapid Upper Limb Assessment (RULA) Method

The final score of the RULA method recapitulation from the data processing of 6 employees in the production administration section 1, production administration 2, PPE administration, company bill data administration, ID Card administration, and BPJS administration at PT. Sidorukun Santosa's work can be seen in Table 13.

Table 13. Final score of RULA recapitulation

Department	*Score* Tabel A	*Score* Tabel B	*Final Score*	Category
Admin Staff Production 1	3	3	4	Further investigation may require changes
Admin Staff Production 2	4	5	5	Further investigation, immediate changes

Staff Admin PPE	3	4	4	Further investigation may require changes
Billing Admin Staff	5	6	7	Further investigation, immediate changes
Staff Admin ID Card	3	3	4	Further investigation may require changes
BPJS Admin Staff	3	4	4	Further investigation may require changes

From the accumulated RULA assessment, the data of 6 admin staff workers at PT Karya Sidorukun Santosa, 50% of respondents or as many as three employees obtained a RULA score of 4, which is included in the category of "Further Investigation, Changes May Be Needed." Meanwhile, 33.3% of respondents or two employees scored 5, indicating the need for immediate change. One employee (16.7%) scored 7, requiring immediate changes and further posture investigation while performing administrative work.[20]

This difference in assessment results is most likely influenced by variations in the anthropometry of each employee, even though they use similar workstations. This shows that using ergonomic desks and chairs can solve the problem of inappropriate work posture[21].

Conclusion

Based on the risk assessment results for 6 administrative employees at PT, Sidorukun Santosa's work using the ROSA and RULA methods found that most workers needed further investigation and improvements to the facilities and workspace layout.

In the assessment using the RULA method, it was obtained that as many as 4 employees, namely Production Worker Admin Staff 1, PPE Admin Staff, ID Card Admin Staff, and BPJS Admin Staff, obtained a score of 4, which is included in the category of "Further Investigation, Changes May Be Needed." In addition, 1 employee, namely Production Worker Admin Staff 2, has a score of 5, and one Billing Admin Staff employee (16.7%) gets a score of 7. These scores of 5 and 7 indicate the need for immediate changes and further investigation regarding posture while performing administrative work.[22]–[25]

Meanwhile, the risk assessment using the ROSA method showed that five out of six workers were in the high-risk category, with a final score between 5 and 7, meaning improvements to facilities and workspace layouts are urgently needed. With a final score of 4, one worker falls into the low or medium category, meaning it does not require immediate improvement.[13]. Overall, from both the RULA and ROSA results, it can be concluded that most workers need ergonomic improvements to their facilities and workspace layouts to improve comfort and reduce the risk of injury

Acknowledge

The author would like to express his deepest gratitude to PT Karya Sidorukun Santosa for giving permission and time to conduct this ergonomic risk assessment research in administrative employees. With the support and good cooperation of all parties in the company, the author could complete this research smoothly. Hopefully, the results of this research can be useful for companies in developing more effective work programs, especially in efforts to prevent work-related diseases and improve employee welfare.

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