

Posture Analysis Using Nordic Body Map and Rapid Office Strain Assessment Methods to Improve Work Posture

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ABSTRACT

Jaya Launch Pad is a company engaged in educational services. It is undeniable that service sector companies such as Jaya Launch Pad also have a workforce whose work posture may be less ergonomic, which can lead to musculoskeletal disorders. Musculoskeletal disorders can be experienced by people of all ages. Therefore, this study focuses on work posture. This research occurred because of complaints experienced by staff. The number of samples used in this study was 1 person. This was influenced by the Covid-19 pandemic situation so that there was only 1 staff when the observation was made. The research method used was the nordic body map (NBM) to determine which parts of the body are experiencing complaints, and the rapid office strain assessment (ROSA) to measure the risk of injury due to the posture of sitting at a computer for 8 hours. The result is that the complaint assessment using the NBM questionnaire has a score of 52 (needs improvement at a later date) with 4 categories of severe pain, namely upper back, lower back, waist, and butt. Meanwhile, the score from the ROSA table is 6 which means it is risky / dangerous so that it needs improvement. Therefore, a proposed condition is given in the form of a replacement of work facilities in the form of a work chair with adjustable height and adjustable armrests. This improvement is assumed to be able to reduce the level of staff complaints, and the calculation result of the rapid office strain assessment (ROSA) is 4 which means no risk so this improvement is accepted and can solve the work posture problem of staff at Jaya Launch Pad.

Keywords: Ergonomics, Musculoskeletal disorders, Nordic Body Map, Rapid Office Strain Assessment

1 INTRODUCTION

Economics is the study of people's behavior in choosing how to use available (scarce) resources to produce various commodities which will then be distributed to individuals and groups of society today or in the future (Mankiw, 2021). In a country, it requires good economic growth to become a prosperous country. Economic growth is the development of activities in the economy that causes the goods or services produced to increase (Mankiw, 2021). Indonesia's economic growth in quarter IV - 2019 decreased compared to quarter IV – 2018 (Ministry of National Development Planning, 2020). This can be seen in Figure 1.

Economic growth in Indonesia in quarters IV - 2019 was dominated by the service sector. Table 1 shows the GDP growth for quarters IV – 2019. The development of economic growth in the service sector encourages this research to occur. This research focuses on the education service sector. This is because the economic growth in education services has increased compared with was the fourth quarter of 2018. Table 2 presents the data on the economic growth of education services. From the business perspective, the level of service needs to be maintained to compete with other companies (Gunawan *et al.*, 2020).

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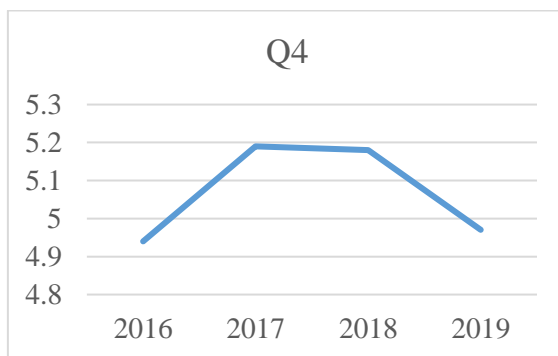


Figure 1. Indonesia's Economic Growth

Table 1. Production Side Economic Growth in Quarter IV - 2019

Industry	3,66 [4,25]
Trading	4,24 [4,41]
Construction	5,79 [5,58]
Agriculture	4,26 [3,84]
Mining	0,94 [2,25]
Transportation and Warehousing	7,55 [5,49]
Financial Services and assurance	8,49 [6,23]
Information and Communication	9,71 [7,09]
Government Administration	2,06 [7,13]
Educational Services	5,46 [4,96]
Accommodation and Food Services	6,41 [5,96]
Real Estate	5,85 [4,16]
Other Services	10,78 [9,05]
Company Services	10,49 [8,94]
Procurement of Electricity and Gas	6,01 [5,46]
Health Services and Social Activities	7,82 [7,84]
Water Supply	5,41 [7,91]

Table 2. GDP Growth in Education Services

Gross Domestic Product	2018: Q4	2019: Q4
Educational Services	5,0	5,5

The service sector also has a workforce. To provide maximum service, labor productivity is needed. Productivity is the ratio between output and input (Heizer, Render and Munson, 2017). Work productivity is the ability to get the maximum benefit from the available facilities and infrastructure by producing optimal output, if possible, the maximum. Productivity is also directly related to effectiveness and efficiency. Previous research tried to increase the efficiency in minimizing transportation waste (Nurprihatin *et al.*, 2019; Nurprihatin and Lestari, 2020). Any waste should be eliminated to achieve efficiency (Tannady *et al.*, 2019). The efficiency was also discussed to minimize the inventory backlog

(Nurprihatin, Jayadi and Tannady, 2020). Increased productivity can be increased by increasing the quality of inputs such as training workers, improving working methods, or replacing work facilities (Heizer, Render and Munson, 2017). Improving the quality of these inputs is closely related to labor conditions.

Ergonomics is a science whose application seeks to harmonize work and the environment with people for work efficiency and comfort (Karwowski and Zhang, 2021). Meanwhile, ergonomics is the study of human behavior, abilities, limitations, and human character that is used to design tools and create an appropriate environment to increase productivity (Soares and Rebelo, 2017).

Ergonomics is divided into several sections with different focuses. The following are the kinds of ergonomics (Soares and Rebelo, 2017):

1. Physical Ergonomics, activities related to human physical activity. An example of a relevant topic is anthropometry.
2. Cognitive Ergonomics, activities related to the mental work of humans. Examples of relevant topics are workload and decision-making.
3. Organizational Ergonomics, activities related to socio-technics in work systems. An example of a relevant topic is human resource management.
4. Environmental Ergonomics, activities related to the work environment around humans. Examples of relevant topics are lighting, noise, vibration, and the temperature at work.

The objectives of applying ergonomics are described as follows (Bridger, 2018):

1. Prevent occupational diseases, improve physical and mental well-being.
2. Improve social welfare through good relations between workers.
3. Increase the efficiency of the human system by balancing all aspects.

After describing the objectives of ergonomics, the following will also explain the benefits of ergonomics (Bridger, 2018):

1. Reducing morbidity due to work.
2. Minimizing work accidents.
3. Reducing medical expenses and compensation that need to be spent.
4. Reduced stress due to work.
5. Increased productivity.
6. The flow of the work process is better.
7. Increased job satisfaction.
8. A sense of security.

Non-ergonomic work posture is one of the problems that cause a decrease in labor productivity. This decrease in the productivity of the workforce can result in a decrease in output. Therefore, an ergonomic work posture is needed to support workforce productivity. In addition, non-ergonomic work postures can cause disorders of the muscles, nerves, bones, and others called musculoskeletal disorders (MSDs) (Jayadi *et al.*, 2020).

MSDs are a condition in which parts of the muscle and bone system experience problems (pain) (Rembulan, Tantio and Wilujeng, 2019; Jayadi *et al.*, 2020). MSDs are a group of occupational diseases (Jayadi *et al.*, 2020). Symptoms that arise are numbness or burning in the hands, reduced strength generated by the limbs, stiffness in joints, pain in certain body parts accompanied by discomfort.

This study aims to analyze the work posture of the Jaya Launch Pad staff using two methods, namely the Nordic Body Map (NBM) method and the Rapid Office Strain Assessment (ROSA) method. The NBM method is used to determine which parts of the body have complaints and classify them into 4 categories so that they are easier to analyze. The ROSA method is used to calculate the risk of injury due to the same work position for 8 hours, namely sitting at a computer. This research is useful to obtain proposed conditions for improvement.

2 METHODOLOGY

2.1 Object of research

This study analyzes the work posture of the staff at Jaya Launch Pad, as well as the complaints they experience. The research object that was taken was the staff at Jaya Launch Pad who was currently Working from Office (WFO), while the other staff were Working from Home (WFH). Data taken by direct observation (primary data). The data taken is in the form of complaint data based on interviews, as well as work posture photo data for the needs of the ROSA method.

2.2 Research Flow Chart

The stages of this research began with data collection in the form of work posture photos and interviews with complaints against staff at the Jaya Launch Pad. This data collection relies on two methods to be used, namely the NBM and ROSA methods. The complaint interview will be used for the NBM method by referring to the NBM questionnaire. Meanwhile, work posture photos will be used for the ROSA method by referring to the ROSA table.

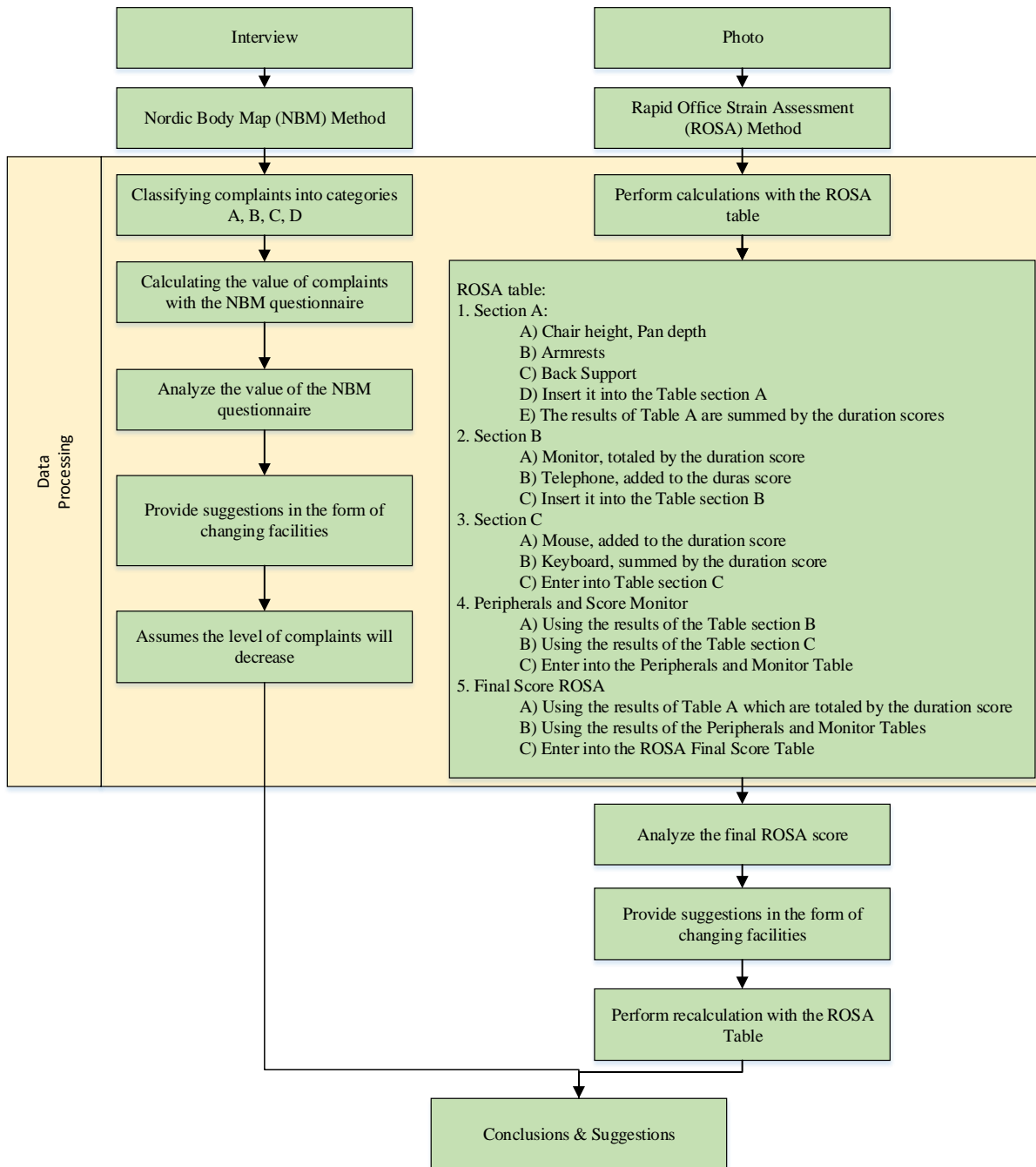


Figure 2. Research Flow Chart

The NBM method will be used to know the complaints experienced by workers while working at the Jaya Launch Pad company (Pratama *et al.*, 2017). This method relies on the use of a questionnaire that has an assessment of 28 points on the body. Of the 28 points, these body parts are described with points starting from zero to 27. Each point of the body part has a possible complaint with 4 categories, namely A, B, C, and D. Category A has a score of 1 (not sick), category B has a score of 2 (slightly sick), category C has a score of 3 (sick), and category

D has a score of 4 (very sick). The total score of the NBM method has 4 categories for actions to be taken. A score of 28 - 49 has a low level of risk which means there is no need for corrective action. A score of 50 - 70 has a moderate level of risk, which means that corrective action is needed later. A score of 71 - 91 has a high level of risk which means that it needs to be improved as soon as possible. A score of 92 until 112 has a very high level of risk, which means that it requires corrective action now.

The ROSA method will be used to know the risk of injury that will occur to workers who use computers (Jayadi *et al.*, 2020). ROSA is used to consider seat posture (chair height, seat width, armrests, and backrest), computer (mouse, monitor, and keyboard), telephone, and the length of each activity (Jayadi *et al.*, 2020). This method has benchmarks with a tool in the form of a ROSA table. The ROSA table is used to calculate the final score after passing many long steps. This method has 2 score categories that indicate a risky or no-risk work posture. Scores of 1 to 5 indicate that the work posture is not dangerous for staff. Meanwhile, a score of more than 5 indicates that the work posture is dangerous for staff.

3 RESULTS AND DISCUSSION

Jaya Launch Pad staff work posture conditions were calculated using interview data and work posture data. Based on the data obtained from data collection it can be stated as follows:

3.1 Current Condition

Based on the data used, the current condition can be divided into two, namely:

1. The Nordic Body Map (NBM) Method
 The NBM method uses data from the results of interviews with complaints experienced by staff based on the NBM questionnaire. In the NBM questionnaire, there are 28 sections of concern for complaints. This questionnaire starts from 0 to 27. Each section is given 4 assessment categories, namely categories A, B, C, and D. Category A means not sick (score 1), category B means slightly sick (score 2), category C means sick (score 3), and category D means very sick (score 4). From the interview results obtained identification of complaints as in Table 3.

From Table 3, sixteen (16) sections have a category A score, 4 parts with category B, 4 parts with category C, and 4 parts with category D. Parts of the body that experience a category D complaint or are very painful are the upper back, lower back, waist, and butt. Parts of the body that experience complaints with category C or pain are the left knee, right knee, left elbow, and right elbow. From these results, it is necessary to add up the overall score. The following is the score calculation for the NBM method.

Table 3. Identification of Complaints Based on the NBM Questionnaire

Staff Name	Age	Length of work	Keluhan			
			Painless (A)	It hurts a little (B)	Sick (C)	Very ill (D)
Octa Andra Ferdian	26 years	2 months	Left Shoulder	Upper Neck	Left Knee	Upper back
			Right Shoulder	Lower Neck	Right Knee	Lower back
			Left Upper Arm	Left Wrist	Left Elbow	Waist
			Right Upper Arm	Right Wrist	Right Elbow	Butt
			Left Forearm			
			Right Forearm			
			Left hand			
			Right hand			
			Left Thigh			
			Right Thigh			
			Left Calf			
			Right Calf			
			Left Ankle			
			Right Ankle			
			Left Foot			
			Right Foot			

Total score = (nA x category A score) + (nB x category B score) + (nC x category C score) + (nD x category D score)

Total Score = (16 x 1) + (4 x 2) + (4 x 3) + (4 x 4)

Total Score = 16 + 8 + 12 + 16

Total Score = 52

So, the total score from the results of the complaint interview based on the NBM method was obtained at 52. This means that there is a need for improvement in the future.

2. Rapid Office Strain Assessment (ROSA) Method

The ROSA method uses data in the form of photos of staff work postures at the Jaya Launch Pad. Figure 3 to Figure 7 shows photos of the staff work posture.



Figure 3. Work Posture of Foot Position Against Chair



Figure 4. Work Posture of Arm Position Against Armrests, and Back Position with Back Support



Figure 5. Eye Position Work Posture Against the Monitor



Figure 6. Work Posture for Telephone and Mouse



Figure 7. Work Posture Against Keyboard

From the work posture photo data shown above, calculations can be made using the ROSA table. Here are the steps for using the ROSA Table:

- a. Give a score for section A.
Section A is divided into several, namely chair height, pan depth, armrests, and back support.

In section A (1) the chair height section scores 2 for chairs that are too high, and the score is added by 1 because the chair cannot adjust the height. In section A (1) in the pan depth section, a score of 2 was obtained for a chair seat that was too

narrow, and the score was added by 1 because the seat width could not be adjusted. Then add the chair height and

pan depth scores so that the score for section A (1) is 6.









Section A - Chair					AREA SCORE
<i>Chair Height</i>					
					Non - Adjustable (+1)
		○			○
Knees at 90° (1)	Too low - Knee Angle <90° (2)	Too High - Knee Angle >90° (2)	No foot contact on ground (3)	Insufficient Space Under Desk - Ability to Cross Legs (+1)	
<i>Pan Depth</i>					AREA SCORE
			Non - Adjustable (+1)		
		○	○		
Approximately 3 inches of space between knee and edge of seat (1)	Too Long - Less Than 3" of Space (2)	Too Short - Less Than 3" of Space (2)			

Figure 8. Section A (1)

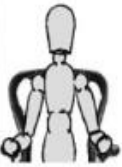
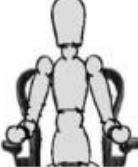
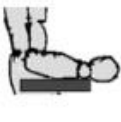

ARMRESTS				AREA SCORE
				Non - Adjustabel (+1)
	○			
Elbows supported in line with shoulders relaxed (1)	Too high (Shoulders Shrugged) / Low (Arms Unsupported) (2)	Hard / damaged surface (+1)	Too Wide (+1)	

Figure 9. Section A (2)

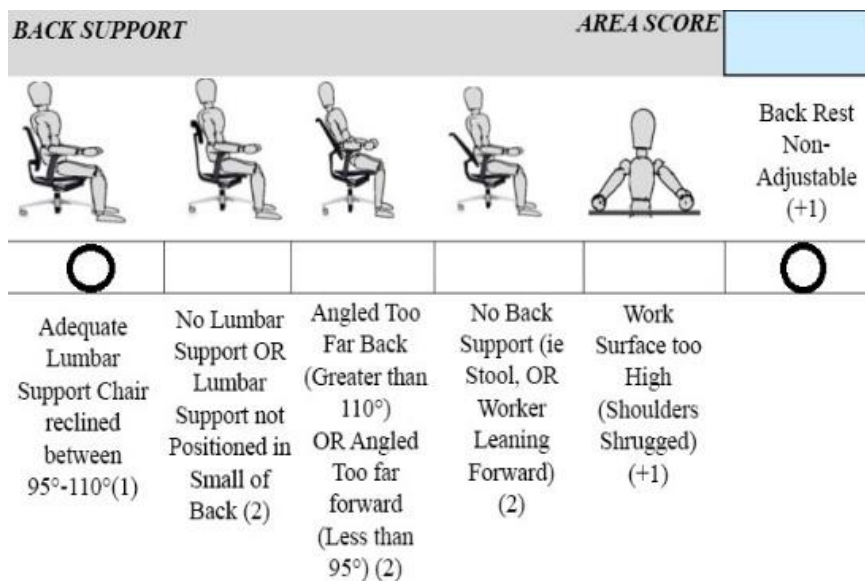


Figure 10. Section A (3)

In section A (2) the armrests section scores 2 for the chair because it does not have armrests.

In section A (3) the back support section scores 1 for a comfortable backrest, and the score is added by 1 because the back support cannot be tilted. The scores of section A (2) and section A (3) need to be added up first. So the total score for section A (2), and section A (3) is 4.

After obtaining the total score for section A (2) with section A (3), and the score for section A (1), the data can be processed into a table to obtain a score for section A.

Table 4. Assessment Section A

		Arms / Back rest							
		2	3	4	5	6	7	8	9
seat pan height /depth	2	1	2	3	4	5	6	7	8
	3	2	2	3	4	5	6	7	8
	4	3	3	3	4	5	7	7	8
	5	4	5	4	4	5	7	7	8
	6	5	5	5	5	5	8	8	9
	7	6	6	6	7	7	8	9	9
	8	7	7	7	8	8	9	9	9
	9	8	8	8	9	9	9	9	9

So a score of 5 is obtained after being entered into the table section A as a whole. However, this score needs to be added up first with the score for the duration of using the chair. The chair

duration score was 1 because it was used for more than 4 hours. So the total score of the chair is 6.

- b. Give a score for section B.
 Section B is divided into two, namely monitor and telephone. On the monitor, place the monitor lower so that the position with the eyes forms an angle of <math><30^\circ</math>. This causes the score given to be 2. Then, the distance between the monitor and the eyes of the staff is more than 75 cm so that an additional score is given of 1. After that, it is necessary to add the duration score of using the monitor, which is 1 because it is used for more than 4 hours. So, the score for the monitor is 4.

On the telephone, the staff answers the telephone with neck and shoulders in support. Therefore a score of 2. Then, while answering the telephone the staff is not free or doing other work. This gives an additional score of 1. Furthermore, the duration of telephone use is still in the range of 1 - 4 hours so the score is not added or 0. So, the score for the telephone is 3.

Table 5 shows the monitor and telephone scores entered in table section B. So a score of 4 is obtained after being entered into the table section B.

Section B - Monitor and Telephone					
Monitor					AREA SCORE
	○				
Arm's Length Distance (40 75 cm) /Screen at Eye Level (1)	Too Low (below 30°) (2) Too Far (+1)	Too high (Neck Extension) (3)	Neck Twist Greater than 30° (+1)	Glare on Screen (+1)	Documents - No Holder (+1)
		DURATION		Monitor Score	
Telephone					AREA SCORE
				No Hands-Free Options (+1)	
		○	○		
Headset / One Hand on Phone & Neutral Neck Posture (1)	Too Far of Reach (outsire of 30cm) (2)	Neck and Shoulder Hold (+2)			
		Duration		Phone Score	
				ROSA SCORE	

Figure 11. Section B

Section C - Mouse and Keyboard					
Mouse					AREA SCORE
○					
Mouse in Line with Shoulder (1)	Reaching to Mouse (2)	Mouse/Keyboard on Different Surfaces (+2)	Pinch Grip on Mouse (+1)	Palmrest in Front of Mouse (+1)	
		DURATION		MOUSE SCORE	
Keyboard					AREA SCORE
					Platform Non-Adjustable (+1)
		○	○		
Wrist Straight, Shoulders Relaxed (1)	Wrists Extended/ Keyboard on Positive Angle (>15° Wrist Extension) (2)	Deviation while Typing (+1)	Keyboard Too High - Shoulders Shrugged (+1)	Reaching to Overhead Items (+1)	

Figure 12. Section C

Table 5. Assessment Section B

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

- c. Give a score for section C.

Section C is divided into two, namely mouse and keyboard. On the mouse side, the mouse is positioned parallel to the shoulders of the staff so that it is given a score of 1. After that, it is necessary to add a score for the duration of using the monitor, which is 0 because its use is not more than 4 hours and not less than 1 hour. So, the score for the monitor is 1.

On the keyboard, the position of the staff's hands on the keyboard deviates so that they are given a score of 1. Then, the location of the keyboard is rather high so that the staff's shoulders are slightly raised, which means that they are given a score of 1. Furthermore, the duration of using the keyboard is more than 4 hours so the score is added 1. So, the score for the keyboard is 3.

Table 6 shows the mouse and keyboard scores entered in table section C. So a score of 3 is obtained after being entered into the table section C.

Table 6. Assessment Section C

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

- d. Obtain a score for peripherals and monitors.
 Peripherals and monitor scores are needed to obtain a final score on the ROSA Table.

The way to get the peripherals and monitor score results is by using the score data for section B and section C. Table 7 shows a table of peripherals and monitors. So a score of 4 was obtained after being entered into the peripherals and monitor table.

Table 7. Peripherals and Monitor Table

		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

- e. Obtain a final score on the ROSA table.
 The final score of the ROSA table will be the last value that shows whether there is a need for improvement or not from the risks that will be caused later. The final score for the ROSA table was obtained by entering the data score from the peripherals and monitors, and the chair score (section A added by the duration score). Table 8 shows the results obtained from the final score table ROSA.

Table 8. Final Score ROSA Table

		Peripherals and Monitor									
		1	2	3	4	5	6	7	8	9	10
Chair	1	1	2	3	4	5	6	7	8	9	10
	2	2	2	3	4	5	6	7	8	9	10
	3	3	3	3	4	5	6	7	8	9	10
	4	4	4	4	4	5	6	7	8	9	10
	5	5	5	5	5	5	6	7	8	9	10
	6	6	6	6	6	6	6	7	8	9	10
	7	7	7	7	7	7	7	7	8	9	10
	8	8	8	8	8	8	8	8	8	9	10
	9	9	9	9	9	9	9	9	9	9	10
	10	10	10	10	10	10	10	10	10	10	10

So, a score of 6 is obtained after being entered into the final score table ROSA. This means that it is risky/dangerous, so it is necessary to have a proposed condition.

3.2 Proposed Condition

Based on the results of calculations and analysis of current conditions, it is necessary to have a proposed condition. The following is a discussion of the proposed conditions:

1. The Nordic Body Map (NBM) Method

From the results that have been obtained in the current condition, it is found that the score for complaints based on the NBM questionnaire is 52. This means that improvements need to be made later. Therefore, it is suggested to replace work facilities, namely work chairs. The replacement of work facilities in the form of work chairs is intended to reduce the complaints experienced by staff. The proposed work chair is a chair that has height-adjustable armrests and an adjustable seat height. Figure 13 presents a projection of a proposed work chair from existing products.



Figure 13. A Work Chair with An Armrest (Adjustable) and An Adjustable Height

The replacement of work facilities in the form of a work chair is assumed to be able to alleviate complaints experienced by staff. From those who complain that they are very sick, the level can be decreased to only sick, or slightly sick, or even hope they can reach the level of painlessness. A satisfactory working atmosphere and the supportive working atmosphere may affect the work environment (Tannady, Erlyana and Nurprihatin, 2019). For further expectations, the employee can reach maximum performance. work environment either

partially or simultaneously has a positive and significant effect in influencing work performance (Tannady, Andry and Nurprihatin, 2020).

2. Rapid Office Strain Assessment (ROSA) Method

From the results that have been obtained in the current condition, it is found that the score for the risk of injury based on the rapid office strain assessment table is 6. This means that this work posture is dangerous, so a proposed condition is needed. The following is the calculation using the ROSA table for the proposed conditions:

a. Give a score for the proposed condition of section A.

In the proposed condition for section A (1) for the chair height section, a score of 1 is obtained for chairs whose height forms an angle of 90° , because the height can be adjusted. In the proposed condition for section A (1) for the pan depth section, a score of 2 is obtained for a chair seat that is too narrow, and the score is increased by 1 because the seat width cannot be adjusted. Then add the score of chair height and pan depth so that the score for the proposed condition section A (1) is 4.

In the proposed conditions section A (2) the armrests section scores 1 for the chair because it has armrests, and can be adjusted.

In the proposed condition for section A (3) the back support section has a score of 1 for a comfortable backrest, and a score of 1 is added because the backrest cannot be tilted. The scores of section A (2) and section A (3) need to be added up first. So the total score for section A (2), and section A (3) is 3.

Section A - Chair					AREA SCORE
<i>Chair Height</i>					
					Non - Adjustable (+1)
○					
Knees at 90° (1)	Too low - Knee Angle <90° (2)	Too High - Knee Angle >90° (2)	No foot contact on ground (3)	Insufficient Space Under Desk - Ability to Cross Legs (+1)	
<i>Pan Depth</i>					AREA SCORE
					Non - Adjustable (+1)
		○	○		
Approximately 3 inches of space between knee and edge of seat (1)	Too Long - Less Than 3" of Space (2)	Too Short - Less Than 3" of Space (2)			

Figure 14. Section A (1) Proposed Conditions

ARMRESTS				AREA SCORE
				Non-Adjustable (+1)
○			1	
Elbows supported in line with shoulders relaxed (1)	Too high (Shoulders Shrugged) / Low (Arms Unsupported) (2)	Hard / damaged surface (+1)	Too Wide (+1)	

Figure 15. Conditions of the Proposed Section A (2)

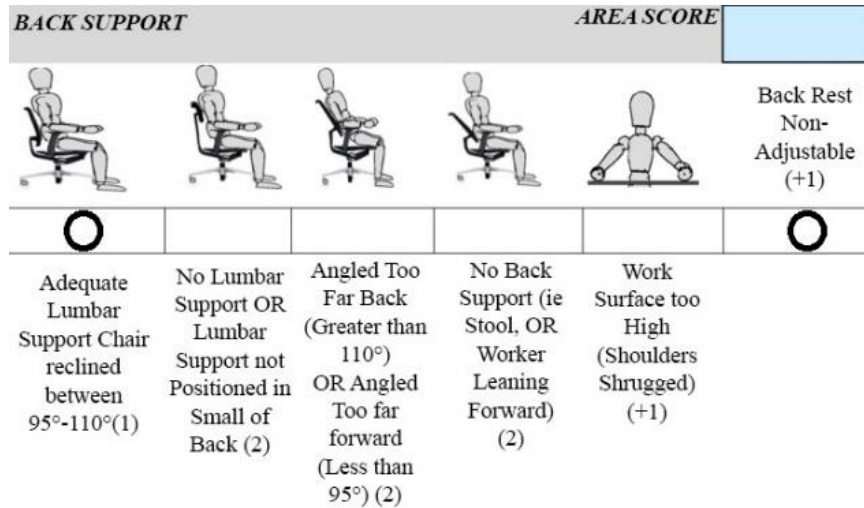


Figure 16. Conditions of Proposed Section A (3)

After obtaining the total score for section A (2) with section A (3), and the score for section A (1), the data can be processed into a table to obtain a score for section A.

Table 9. Condition Assessment of Proposed Section A

		Arms / Back rest							
		2	3	4	5	6	7	8	9
seat pan height /depth	2	1	2	3	4	5	6	7	8
	3	2	3	4	5	6	7	8	
	4	3	4	5	7	7	8		
	5	4	5	4	4	5	7	7	8
	6	5	5	5	5	5	8	8	9
	7	6	6	6	7	7	8	9	9
	8	7	7	7	8	8	9	9	9

So a score of 3 is obtained after being entered into the table section A as a whole. However, this score needs to be added up first with the score for the duration of using the chair. The chair duration score was 1 because it was used for more than 4 hours. So the total score of the chair is 4.

- b. Provide a score for the proposed condition of section B.

In the proposed condition section B is not given the proposed condition or it is the same as the current condition. Therefore, the calculation process is not displayed again. This means that the total score of the proposed condition for section B is 4.

- c. Provide a score for the proposed conditions of section C.

In the proposed condition section C is not given the proposed condition or it is the same as the current condition. Therefore, the calculation process is not displayed again. This means that the total score for the proposed condition section C is 3.

- d. Obtain a score for the proposed peripherals and monitors.

In the condition that the proposed peripherals and monitors are not given the proposed condition or the same condition as the current condition because the condition of the proposed section B, and the condition of the proposed section C has not changed. Therefore, the calculation process is not displayed again. This means that the total score for the proposed peripherals and monitors condition is 4.

- e. Obtain the proposed conditions for the final score of the ROSA Table.

The condition of the proposed final score in the ROSA table will be the final value that indicates whether the improvements given are accepted and successfully change the risk score. The proposed condition for the final score of the ROSA table is obtained by entering the data score from the peripherals and monitors, and the chair score (the proposed conditions for section A are added up by the duration score). Table 10 shows the results obtained from the final score table ROSA.

Table 10. Final Score ROSA Table

		Peripherals and Monitor									
		1	2	3	4	5	6	7	8	9	10
Chair	1	1	2	3	4	5	6	7	8	9	10
	2	2	2	3	4	5	6	7	8	9	10
	3	3	3	3	4	5	6	7	8	9	10
	4	4	4	4	4	5	6	7	8	9	10
	5	5	5	5	5	5	6	7	8	9	10
	6	6	6	6	6	6	6	7	8	9	10
	7	7	7	7	7	7	7	7	8	9	10
	8	8	8	8	8	8	8	8	8	9	10
	9	9	9	9	9	9	9	9	9	9	10
	10	10	10	10	10	10	10	10	10	10	10

The condition for the proposed final score table ROSA is 4. This means that the improvements given are accepted, and are not risky/dangerous for staff.

4 CONCLUSION

From the above results, it can be concluded that the staff work posture at Jaya Launch Pad has a problem, where this problem causes complaints of pain in certain parts of the body. Complaints of pain which are categorized as very painful occur in parts of the body such as the upper back, lower back, waist, and butt. Meanwhile, complaints of pain in the category of pain occur in parts of the body such as the left knee, right knee, left elbow, and right elbow. In addition, these complaints can also be a sign that there is a risk of injury based on calculations using the ROSA method.

The results of the NBM method based on the questionnaire contained 16 pain points, 4 mild pain points, 4 pain points, and 4 very painful points. After totaling, the score is 52. This shows that the work posture has problems so that it is of moderate value or needs improvement at a later date.

The results of the ROSA method based on calculations using the ROSA table obtained a final score of 6. This indicates that the score is greater than 5. A score that greater than 5 means that there are problems in work posture so that it is dangerous for staff. These results indicate the need to provide proposed conditions.

From the results of the NBM and ROSA methods, it is clear that there are problems with staff work posture. Therefore, the existence of the proposed conditions is very important. The proposed condition is a replacement of work facilities, namely a work chair. This work chair must be height-adjustable and have adjustable armrests. The proposal to change work chairs is given because work facilities can make work

posture less good. From the change of work chairs, it is assumed that the complaints experienced by staff will have a decrease in level. For example, from being very sick to being sick, slightly ill, or expected to be not sick. In addition, after being calculated using the ROSA method, a final score of 4 was obtained, which means that the proposal was accepted and could be made for improvement.

The suggestions that can be given to this research are considering other methods, considering the object of research in a wider scope, and making observations not only for 1 person but more so that it can better describe the real situation.

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