

PROPOSAL FOR IMPROVING THE WORK POSTURE OF STITCHING OPERATORS AT CV. INDONESIA JAYA USING THE RULA METHOD

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ABSTRACT

This study evaluates the effectiveness of the Rapid Upper Limb Assessment (RULA) method in improving work posture in industrial settings. Poor posture can lead to musculoskeletal disorders and reduced productivity. Using a quantitative approach, RULA was applied across several production departments, with data collected through direct field observation. The analysis shows that RULA significantly improved work posture, reduced discomfort, and lowered the risk of musculoskeletal injuries. The study supports RULA as an effective tool for posture improvement and recommends integrating regular ergonomic evaluations into work design.

KEYWORDS

Ergonomics, Rapid Upper Limb Assessment, Musculoskeletal Disorders



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INTRODUCTION

Ergonomics is the science or discipline that studies humans as components of a work system, including both physical and non-physical characteristics, human limitations, and abilities, with the aim of designing systems that are effective, safe, healthy, and comfortable (Septian et al., n.d.). Ergonomic control is beneficial for adjusting the work environment to suit the worker. Ergonomic control aims to ensure that workers' bodies are in good positions and to reduce work-related risks (Kristanto, Saputra, 2019). CV. Indonesia Jaya is a company engaged in book printing located in Surakarta City. The book production process at CV. Indonesia Jaya involves three work stations: web offset, stitching, and coversheet. At the stitching work station, operators perform tasks while maintaining awkward postures, which results in complaints of musculoskeletal disorders (MSDs).

During the production process, it was found that the work facilities were not ergonomic because the chair seat was almost level with the desk surface. This caused operators to perform their tasks of arranging books while bending over, and the operators' knees could not fit under the desk. This phenomenon indicates that improvements in work posture at the stitching workstation are necessary to make it more ergonomic, thereby reducing complaints of musculoskeletal disorders (MSDs) experienced by operators.

Musculoskeletal disorders (MSDs) occur in various types of manufacturing industries worldwide, including Indonesia. This highlights the need for serious attention from management to address ergonomic issues and mitigate risks to operators. Therefore, identifying ergonomic risks is crucial as an initial step in prevention, by providing good work postures based on ergonomic methods (Bastuti et al., 2019).

The Rapid Upper Limb Assessment (RULA) method can be used to address and reduce complaints experienced by operators at the stitching workstation. The RULA method is designed to investigate and assess the posture of the upper body (Utomo et al., n.d.). The objective of this study is to determine improvements in the work

posture of operators at the stitching workstation at CV. Indonesia Jaya using the Rapid Upper Limb Assessment (RULA) method.

RESEARCH METHOD

This study was conducted at the stitching workstation where tasks involve arranging books. Data collection was performed through interviews and documentation to investigate the musculoskeletal disorders (MSDs) experienced by operators. Documentation was then gathered to identify the degree of strain on specific body parts. The next step involved processing the collected data using the Rapid Upper Limb Assessment (RULA) method. In the RULA method, the first stage involves evaluating the scoring sheet, followed by determining the final RULA score and classifying the level of corrective action required

RESULT AND DISCUSSION

Assessment using the RULA method requires documentation of the operator's posture while performing the task of arranging books. The activity of handling stacks of bound books to the left of the operator necessitates a slight rotation of the body, and while arranging the books, the operator's head is slightly bent forward. This positioning leads to operator fatigue. Documentation of the operator's posture while arranging books can be seen in Figure 2.1.

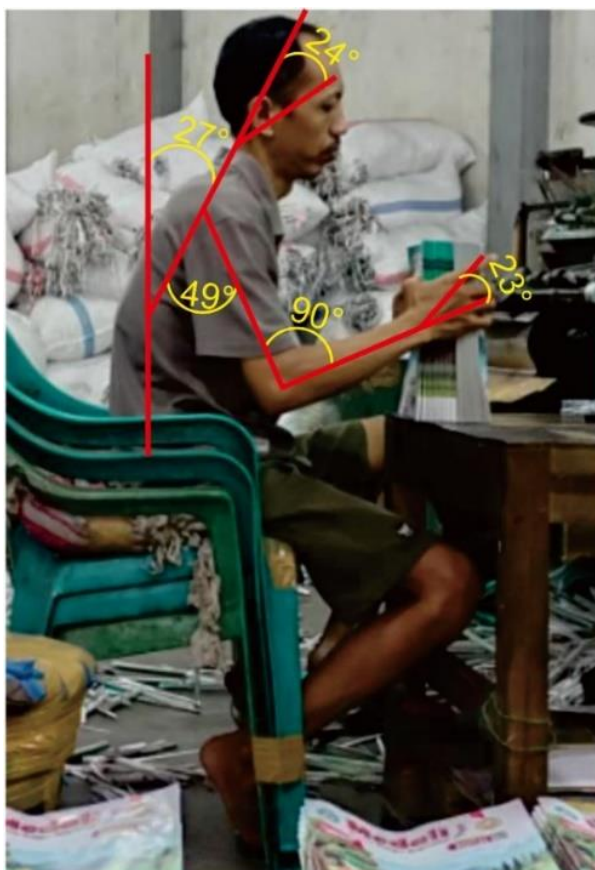


Figure 2.1

The assessment using the Rapid Upper Limb Assessment (RULA) method can be viewed in Figure 2.2, which shows the RULA Employee Worksheet Assessment. Standardization has been applied, and it has been established as the basis for calculating the RULA method.

RULA Employee Assessment Worksheet based on RULA: a survey method for the investigation of work-related upper limb disorders, McAtamney & Corlett, Applied Ergonomics 1993, 24(2), 91-99

A. Arm and Wrist Analysis

Step 1: Locate Upper Arm Position:
 Diagrams showing angles: 20°, 20°, 20°, 20-45°, 90°.
 Step 1a: Adjust...
 If shoulder is raised: +1
 If upper arm is abducted: +1
 If arm is supported or person is leaning: -1
 Upper Arm Score

Step 2: Locate Lower Arm Position:
 Diagrams showing angles: 90°, 60°. Add +1.
 Step 2a: Adjust...
 If either arm is working across midline or out to side of body: Add +1
 Lower Arm Score

Step 3: Locate Wrist Position:
 Diagrams showing angles: 0°, 15°, 30°. Add +1.
 Step 3a: Adjust...
 If wrist is bent from midline: Add +1
 Wrist Score

Step 4: Wrist Twist:
 If wrist is twisted in mid-range: +1
 If wrist is at or near end of range: +2
 Wrist Twist Score

Step 5: Look-up Posture Score in Table A:
 Using values from steps 1-4 above, locate score in Table A.

Step 6: Add Muscle Use Score
 If posture mainly static (i.e. held 10 minutes):
 Or if action repeated occurs 4X per minute: -1
 Muscle Use Score

Step 7: Add Force/Load Score
 If load < 4.4 lbs (assessment): +0
 If load 4.4 to 22 lbs (assessment): +1
 If load 4.4 to 22 lbs (static or repeated): +2
 If more than 22 lbs or repeated or shocks: +3
 Force/Load Score

Step 8: Find Row in Table C
 Add values from steps 5-7 to obtain Wrist and Arm Score. Find row in Table C.

SCORES

Table A: Wrist Posture Score

Upper Arm	Lower Arm	Wrist					
		Twist	Twist	Twist	Twist		
1	1	1	2	2	2	3	3
1	2	2	2	2	3	3	3
1	3	2	3	3	3	3	4
2	1	2	3	3	3	4	4
2	2	3	3	3	3	4	4
2	3	3	4	4	4	4	5
3	1	3	4	4	4	4	5
3	2	3	4	4	4	4	5
3	3	4	4	4	4	4	5
4	1	4	4	4	4	4	5
4	2	4	4	4	4	4	5
4	3	4	4	4	4	4	5
5	1	5	5	5	5	5	6
5	2	5	5	5	5	5	6
5	3	5	5	5	5	5	6
6	1	6	6	6	6	6	7
6	2	6	6	6	6	6	7
6	3	6	6	6	6	6	7
6	4	6	6	6	6	6	7
6	5	6	6	6	6	6	7
6	6	6	6	6	6	6	7
6	7	6	6	6	6	6	7
6	8	6	6	6	6	6	7
6	9	6	6	6	6	6	7

Table C: Neck, trunk and leg score

Wrist and Arm Score	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	5
4	4	4	4	4	4	5	5
5	4	4	4	4	4	5	5
6	4	4	4	4	4	5	5
7	5	5	5	5	5	6	6
8	5	5	5	5	5	6	6
9	5	5	5	5	5	6	6

Table B: Trunk Posture Score

Neck	Trunk Posture Score						
	1	2	3	4	5	6	7
1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	9

Table C: Neck, trunk and leg score

Wrist and Arm Score	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	5
4	4	4	4	4	4	5	5
5	4	4	4	4	4	5	5
6	4	4	4	4	4	5	5
7	5	5	5	5	5	6	6
8	5	5	5	5	5	6	6
9	5	5	5	5	5	6	6

Table B: Trunk Posture Score

Neck	Trunk Posture Score						
	1	2	3	4	5	6	7
1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	9

Table C: Neck, trunk and leg score

Wrist and Arm Score	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	5
4	4	4	4	4	4	5	5
5	4	4	4	4	4	5	5
6	4	4	4	4	4	5	5
7	5	5	5	5	5	6	6
8	5	5	5	5	5	6	6
9	5	5	5	5	5	6	6

Table B: Trunk Posture Score

Neck	Trunk Posture Score						
	1	2	3	4	5	6	7
1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	9

Table C: Neck, trunk and leg score

Wrist and Arm Score	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	5
4	4	4	4	4	4	5	5
5	4	4	4	4	4	5	5
6	4	4	4	4	4	5	5
7	5	5	5	5	5	6	6
8	5	5	5	5	5	6	6
9	5	5	5	5	5	6	6

Table B: Trunk Posture Score

Neck	Trunk Posture Score						
	1	2	3	4	5	6	7
1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	9

Table C: Neck, trunk and leg score

Wrist and Arm Score	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	5
4	4	4	4	4	4	5	5
5	4	4	4	4	4	5	5
6	4	4	4	4	4	5	5
7	5	5	5	5	5	6	6
8	5	5	5	5	5	6	6
9	5	5	5	5	5	6	6

Table B: Trunk Posture Score

Neck	Trunk Posture Score						
	1	2	3	4	5	6	7
1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	9

Table C: Neck, trunk and leg score

Wrist and Arm Score	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	5
4	4	4	4	4	4	5	5
5	4	4	4	4	4	5	5
6	4	4	4	4	4	5	5
7	5	5	5	5	5	6	6
8	5	5	5	5	5	6	6
9	5	5	5	5	5	6	6

Table B: Trunk Posture Score

Neck	Trunk Posture Score						
	1	2	3	4	5	6	7
1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	9

Table C: Neck, trunk and leg score

Wrist and Arm Score	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	5
4	4	4	4	4	4	5	5
5	4	4	4	4	4	5	5
6	4	4	4	4	4	5	5
7	5	5	5	5	5	6	6
8	5	5	5	5	5	6	6
9	5	5	5	5	5	6	6

Table B: Trunk Posture Score

Neck	Trunk Posture Score						
	1	2	3	4	5	6	7
1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	9

Table C: Neck, trunk and leg score

Wrist and Arm Score	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	5
4	4	4	4	4	4	5	5
5	4	4	4	4	4	5	5
6	4	4	4	4	4	5	5
7	5	5	5	5	5	6	6
8	5	5	5	5	5	6	6
9	5	5	5	5	5	6	6

Table B: Trunk Posture Score

Neck	Trunk Posture Score						
	1	2	3	4	5	6	7
1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	9

Table C: Neck, trunk and leg score

Wrist and Arm Score	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	5
4	4	4	4	4	4	5	5
5	4	4	4	4	4	5	5
6	4	4	4	4	4	5	5
7	5	5	5	5	5	6	6
8	5	5	5	5</			

As can be seen in the figure, scoring posture is 6

Table Wrist and Arm Score

Posture A		6
Muscle Use	Repeated occur 4x per minute	1
Force	Under 4.4lbs	0
Total Score Wrist and Arm Score		7

Tabel 1. RULA Scoring Grup B

Body Part	Movement	Adjustment	Value
Neck	24° (+3)	Neck is twisted (+1)	+4
Trunk	27° (+3)	Trunk is twisted (+1)	+4
Legs		Leg aren't supported (+2)	+2

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

Figure 2.4 Scoring RULA Group B

Tabel Neck and Trunk

Postur B Score		7
Muscle Use	Repeated occur 4x per minute	1
Load/ Force	Under 4.4lbs	0
Total Score		8

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

RULA 2.5 Score Table C

Hasil Analisa RULA pada operator stitching

Risk Category	RULA Score	Action
Very High	7	Investigate and implement change

Proposed priorities for improvement of work performance are given to activities that have a medium risk level with a calculation of the possibility of improvement as seen in Table 17.

Upper Arm	0° - 20°
Lower Arm	60° - 100°
Wrist	0° - 15°
Neck	0° - 20°

Trunk	0° - 2°
Legs	Use supported

CONCLUSION

The results of the series of research carried out can be concluded as follows:

1. The results of the identification of stitching operators' complaints when doing jobdex tidying up books, operators experienced complaints that they felt very sick. Based on the identification with the RULA method, a score of 7 was obtained and included in the action level 4 category, so investigations and changes must be carried out as soon as possible.
2. The proposed improvements were made to give space for workers to move around and reduce the risk level of musculoskeletal disorders. Proposed improvements are in the position of the upper arm with an improvement to form an angle of 0 - 20°, the position of the forearm with an improvement to form an angle of 60 - 100°, the wrist to form an angle of 0 - 15°, the neck to improve the angle of the range 0 - 20°, the back with an improvement to form an angle of 0 -20° and the legs supported by the backrest

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