

Assessment of the Work Posture Risk Level of the Canting Process Batik Maker Based on the Rapid Entire Body Assessment (REBA) Method (Case Study: Batik Tulis Tengah Sawah Pacitan)

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ABSTRAK

Batik Tulis Tengah Sawah dapat dikenal sebagai salah satu jenis UKM di Pacitan dan masih terkait dengan batik tulis. Dalam pembuatannya, pembatik duduk di kursi pendek (dingklik) dari kayu tanpa sandaran untuk membuat canting. Tungku yang digunakan untuk membantu peleburan malam sangat kecil dan juga tidak memiliki meja untuk menaruhnya dan digunakan oleh 2 pembatik, kemudian mereka duduk miring di depan gawangan, yang menyebabkan mereka duduk sedikit membungkuk. Untuk itu, perlu dilakukan penelitian mengenai tingkat risiko postur kerja pembatik saat melakukan proses canting. Tujuan dari penelitian ini adalah untuk membantu mengevaluasi postur kerja pembatik saat melakukan proses canting sehingga dapat dilakukan tindakan korektif untuk mengurangi keluhan muskuloskeletal dan postur membungkuk. Hasil penelitian ini adalah penilaian postur kerja pembatik terhadap tingkat risiko pada seluruh tahapan kegiatan proses canting memiliki skor REBA sebesar 5 yang termasuk dalam tingkat risiko sedang atau sedang dengan tindakan yang perlu dilakukan perbaikan.

Kata kunci: *Rapid Entire Body Assessment, Musculoskeletal Disorders, Postur Kerja*

ABSTRACT

Batik Tulis Tengah Sawah can be known as one type of UKM in Pacitan and is related in hand-written batik. In their production, the batik maker sits on a short chair (dingklik) from wood that has no backrest to make the canting. The stove is used in order to help melting malam is really small and also it had no table in putting it on and used by 2 makers of batik, then it takes them to sit obliquely in front of the gawangan, causing them to sit in a slight bow. So that, it is needed to go through the level if risk level of the work posture from the batik maker when doing the process of canting. The goal of this study is to help evaluating the batik maker's work posture during doing the canting process so that corrective action can be taken to reduce musculoskeletal complaints and bending posture. The result of this research is that the assessment of batik maker's work posture on their risk level in all stages of the canting process activity has a REBA score of 5, which is included in the moderate or medium risk level with actions that need to be corrected.

Keywords: Rapid Entire Body Assessment, Musculoskeletal Disorders, Work Posture

1. Preliminary

Batik Tulis Tengah Sawah can be known as one of the Small and Medium Enterprises (UKM) located in Pacitan and is related to the

handicraft of written batik. This batik craft business is a family business founded by Mr. Budi Raharjo and his wife, Mrs. Toni Retno, based on their interest in learning and making their own handwritten batik. Batik Tulis

Tengah Sawah can produce batik up to 75 pieces of batik every month or depending on the number of orders.

The production process of making written batik occurs a lot at the canting station, including the canting process, the process of giving isen-isen and the process of closing the dyed part with wax. The canting process of making written batik needed quite a long time, approximately \pm 6-8 hours a day. There were 30 batik makers in the canting process. In the process of production, the maker of batik performs the way of canting in sitting position on a short wooden chair (dingklik) without any back support. The batik maker performs the canting process by sitting obliquely facing the cloth which is placed on a stretch of wood called gawangan. The height of the short chair (dingklik) is \pm 25 cm while the gawangan used to lay the cloth has a height of \pm 88 cm. The stove is used in order to help melting malam / candle is known small, no table is needed to put it on, and also 2 makers of batik used it, so it makes them to sit at one side across the gawangan because they have to share the stove with other batik maker. During the canting process, the batik maker is sitting with a slight bow, the right hand is used to hold the canting tool to rub the wax on the cloth and the left hand is used to hold the bottom of the cloth which is used as a support. In Lindawati & Mulyono's (2018) research, it is stated that in general the dingklik and gawangan designs used for batik makers are currently made without considering the worker's body posture and ergonomic rules. So that these conditions can cause the batik maker to be in unnatural worker attitude and have the potential that cause discomfort during work.

Complaints musculoskeletal are complaints that occur in parts of the muscles and skeleton characterized by mild pain to severe or acute pain (Arifin & Suryoputro, 2019). Musculoskeletal complaints can affect workers health and productivity. In general,

this complaint occurs because of an inappropriate work posture, excessive activity, repetitive movements and an inadequate workplace. Posture is an important consideration in designing work and workplace methods because it can affect the ability of workers to do their jobs without any adverse health effects such as discomfort during working, fatigue and complaints of musculoskeletal disorder (Lop, Salleh, Zin, & Saidin, 2019). Physical activity carried out in a non-ergonomic workplace can cause muscle and joint injuries or disorders. Moreover, work which is influenced more by mental stuffs can also give the potential to make musculoskeletal complaints (Sutapa, Sutapa, & Susila, 2017).

This research was done to help evaluating the posture of work from the batik makers when performing the canting process so that corrective action can be taken to reduce musculoskeletal complaints and bowing posture. The contribution of this research that it can be used as input for business owners of Batik Tulis Tengah Sawah business to improve and evaluate the work posture of batik maker when doing the canting process, increasing readers knowledge, and developing science.

2. Methodology

Assessment of batik maker work posture risk level applying the Rapid Entire Body Assessment (REBA). As we known that term of REBA itself can be applied in order to detect the risk's work postures so that preventive steps can be taken by making immediate repairs. Assessment of work posture using this method, by giving the risk score between 1 to 15, the highest score indicates the level that causes a large risk (danger) to be carried out in the work process. This means that the lowest score will guarantee the work under study is free from ergonomic hazards.

In Lindawati & Mulyono's (2018) research, the assessment of the working posture of batik maker using the REBA method is known that the right working posture is in the medium category at 86.67% and also the left posture of working is in the medium category at 80.00% so corrective action is needed. The cause of the work posture of batik maker is not ergonomic because the chair used is a short chair or "dingklik" which does not have a backrest so that the working posture of batik maker will tend to bend. These working conditions cause the batik maker to be in a non-ergonomic working attitude which has the potential to cause work discomfort.

Assessment through the method of REBA which was revealed by Dr. Sue Hignett and Dr. Lynn McAtamney is described using these following stages (McAtamney & Hignett, 2000) :

Stage 1 :

Collecting work posture data using the help of photos or videos.

Stage 2 :

Identification of the viewpoint the worker's body part. The segments of body itself then are classified into 2 groups, called as group A and also group B. Group A takes the neck, back (torso), and also legs. While group B is the part of lower arms, upper arms, and also wrists. The score according to the data's viewpoint of the segments of body of every group can be known, then the score is used to get the table A score based on table A and also the table B score based on table B.

Stage 3 :

Determination of the object weight to be coupling, lifted, and also the activities of the worker. Apart from giving a score for each segment of body, other factors needed to be included are the load coupling, weight, and the activities of those workers.

Stage 4 :

The value calculation of REBA for the work posture to be concerned. As it is obtaining the

score that comes from the REBA's A table then the score for the load lifted of weight is added to obtain the value of section A. While the scores from the REBA's B table are added to the scores from the table of coupling so that obtained the section B value. From the values of parts A and B can be used to obtain the value of section C based on the REBA's C table. The REBA's value is coming from the section C sum value with the worker activity's value. According to the value of REBA, it is revealed that the risk level and actions should be done in order to help reducing risk and also improving methods of work.

3. Results and Discussion

The steps taken before assessing the risk level of work posture using REBA are draw out the workers' viewpoint of the batik maker work posture first as shown in Figure 1. Drawing out the worker's viewpoint was performed using CorelDRAW X7 software. The first step is to draw a line 180° right at the center of the body of the batik maker, usually in the hip area. The second is to draw a straight line from the hips to the neck, which is the angle or part of the trunk, then draw a line from the end of the neck towards the movement of the head which is the angle or part of the neck. The third is to draw a line from the hips to the knees, then draw another line from the knees towards the ankles where the legs are angled. The fourth is to draw a line from the base of the arm towards the elbow which is the angle or part of the upper arm, then draw another line from the elbow towards the wrist which is the angle or part of the lower arm, and draw the corner or part back from the wrist towards the top of the finger which is the angle or part of the wrist.



Figure 1. Withdrawal of the Working Posture of the Batik Maker When Scratching the Canting on the Fabric

For body part A's postures include Neck, Trunk, and Legs. In addition, in the body A is also identified about Force / Load. Whereas for body part B's posture includes Upper arm, Lower Arm, and Wrist and identified about Coupling. The Table 1 below shows a recapitulation table of the posture scores of body parts A and B when scratching the canting on the fabric.

Table 1. Recapitulation of Posture Score Batik Maker When Scratching the Canting of the Fabric

	Description	Standpoint	Score
A	Neck Score	26.70°	2
	Trunk Score	35.34°	3
	Leg Score	70.74°	2
	Force / Load Score	-	0
B	Upper Arm Score	41.35°	2
	Lower Arm Score	30.51°	2
	Wrist Score	27.44°	2
	Coupling Score	-	0

Table 2. Table A's Score

Table A	Neck												
	Legs	1				2				3			
Trunk Posture Score	1	1	2	3	4	1	2	3	4	1	2	3	4
	2	2	3	4	5	3	4	5	6	4	5	6	7
	3	2	4	5	6	4	5	6	7	5	6	7	8
	4	3	5	6	7	5	6	7	8	6	7	8	9
	5	4	6	7	8	6	7	8	9	7	8	9	9
Posture Score A		Force / Load Score						Score A					
5		0						5					

From the recapitulation of the posture of score A and identification of the force / load score of the batik maker when scratching the canting on the fabric, then an assessment is made for the score A. Table 2 shows the result of score A, that is 5.

Likewise, for the recapitulation of score B and identification of the batik maker coupling when scratching the canting on the fabric, an assessment was also carried out for score B. Table 3 shows the result of score B, that is 3.

Table 3. Table B's Score

Table B	Lower Arm						
	Wrist	1			2		
Upper Arm Score	1	1	2	2	1	2	3
	2	1	2	3	2	3	4
	3	3	4	5	4	5	5
	4	4	5	5	5	6	7
	5	6	7	8	7	8	8
	6	7	8	8	8	9	9
Posture Score B		Coupling Score		Score B			
3		0		3			

Then from the results of the score A and also the score B is an assessment of the score C. The result of the score C is 4. After that, the identification of the Score of Activity is +1 in repeating the small action range (up to 4x per minute) because the activity of scratching the canting on the fabric is done by the batik maker. This is a small action that is done repeatedly because you have to repeatedly fill the canting with wax. The final step is to add the C score with the Activity Score so that the REBA's score is obtained.

The REBA's score for the batik maker when scratching the canting on the fabric is 5. Table 4 shows the REBA's score of the batik maker when scratching the canting on the fabric.

The REBA's score of the batik maker when scratching the canting on the fabric is 5 which means it is included in the score 4-7. This means that a score of 5 has a moderate or medium risk level and needs should improve.

Table 4. REBA's Score Table for Batik Maker When Scratching the Canting on the Fabric

Score A	Table C																	
	Score B																	
	1	2	3	4	5	6	7	8	9	10	11	12						
1	1	1	1	2	3	3	4	5	6	7	7	7						
2	1	2	2	3	4	4	5	6	6	7	7	8						
3	2	3	3	3	4	5	6	7	7	8	8	8						
4	3	4	4	4	5	6	7	8	8	9	9	9						
5	4	4	4	5	6	7	8	8	9	9	9	9						
6	6	6	6	7	8	8	9	9	10	10	10	10						
7	7	7	7	8	9	9	9	10	10	11	11	11						
8	8	8	8	9	10	10	10	10	10	11	11	11						
9	9	9	9	10	10	10	11	11	11	12	12	12						
10	10	10	10	11	11	11	11	12	12	12	12	12						
11	11	11	11	11	12	12	12	12	12	12	12	12						
12	12	12	12	12	12	12	12	12	12	12	12	12						
Table C Score	Activity Score						REBA Score											
	4						1						5					

The process of canting written batik results in several stages of activity as shown in Figure 2. The activity stages include setting up the stove to melt the wax, filling the canting utensil with wax, and scratching the canting containing wax on the cloth. An assessment of the level of risk of the posture of work of batik maker using REBA was also carried out at the activity stage of setting up the stove to melt the wax.



Figure 2. Withdrawal of the Working Posture of the Batik Maker When Setting Up the Stove for Melting the Wax

Table 5 shows the recapitulation table posture score body parts A and B batik maker when setting up the stove to melt the wax.

Table 5. Recapitulation of Posture Score Batik Maker When Setting Up the Stove for Melting the Wax

	Description	Standpoint	Score
A	Neck Score	30.99°	2
	Trunk Score	22.08°	3
	Leg Score	71.28°	2
	Force / Load Score	-	0
B	Upper Arm Score	41.71°	2
	Lower Arm Score	23.20°	2
	Wrist Score	30.93°	2
	Coupling Score	-	0

From the recapitulation of the posture score A and identification of the force /load score of the batik maker when setting up the stove for melting the wax then an assessment is made for the score A. Table 6 shows the result of the score A, that is 5.

Table 6. Table A's Score

Table A	Neck												
	1				2				3				
Legs	1	2	3	4	1	2	3	4	1	2	3	4	
Trunk Posture Score	1	1	2	3	4	1	2	3	4	3	3	5	6
	2	2	3	4	5	3	4	5	6	4	5	6	7
	3	2	4	5	6	4	5	6	7	5	6	7	8
	4	3	5	6	7	5	6	7	8	6	7	8	9
	5	4	6	7	8	6	7	8	9	7	8	9	9
Posture Score A		Force / Load Score				Score A							
5		0				5							

Likewise, for the recapitulation of score B and identification of the batik maker coupling when setting up the stove for melting the wax, an assessment was also carried out for score B. Table 7 shows the result of score B, that is 3.

Table 7. Table B's Score

Table B	Lower Arm						
	1			2			
Wrist	1	2	3	1	2	3	
Upper Arm Score	1	1	2	2	1	2	3
	2	1	2	3	2	3	4
	3	3	4	5	4	5	5
	4	4	5	5	5	6	7
	5	6	7	8	7	8	8
	6	7	8	8	8	9	9
Posture Score B		Coupling Score		Score B			
3		0		3			

Then from the results of the score A and also B is an assessment of the score C. The result of the score C is 4. After that, the identification of the Activity Score is known +1 in repeating small actions *range* (up to 4x per minute). The final step is to add the results of the score C with Activity Score so that the results obtained REBA's score.

The results of the REBA's score batik maker when doing setting up the stove for melting the wax is 5. Table 8 shows the results of the score REBA batik maker when doing setting up the stove for melting the wax.

Table 8. REBA's Score Table for Batik Maker When Setting Up the Stove for Melting the Wax

Score A	Table C											
	Score B											
	1	2	3	4	5	6	7	8	9	10	11	12
1	1	1	1	2	3	3	4	5	6	7	7	7
2	1	2	2	3	4	4	5	6	6	7	7	8
3	2	3	3	3	4	5	6	7	7	8	8	8
4	3	4	4	4	5	6	7	8	8	9	9	9
5	4	4	4	5	6	7	8	8	9	9	9	9
6	6	6	6	7	8	8	9	9	10	10	10	10
7	7	7	7	8	9	9	9	10	10	11	11	11
8	8	8	8	9	10	10	10	10	10	11	11	11
9	9	9	9	10	10	10	11	11	11	12	12	12
10	10	10	10	11	11	11	11	12	12	12	12	12
11	11	11	11	11	12	12	12	12	12	12	12	12
12	12	12	12	12	12	12	12	12	12	12	12	12
Table C Score	Activity Score				REBA Score							
4	1				5							

The REBA's score of the batik maker when setting up the stove for melt the wax is 5 which means it is included in the score 4-7. This means that a score of 5 has a moderate or medium risk level and also needs should get improved.

The following is an assessment of the work posture's risk level of those batik maker using REBA at the activity stage of filling the canting tools with the wax as shown in Figure 3.



Figure 3. Withdrawal of the Working Posture of the Batik Maker When Filling the Canting Tool with the Wax

Table 9 shows a recapitulation table of the posture scores of the body parts A and B of the batik maker when filling the canting tool with the wax.

Table 9. Recapitulation of Posture Score Batik Maker When Filling the Canting Tool with the Wax

	Description	Standpoint	Score
A	Neck Score	25.91°	2
	Trunk Score	22.37°	3
	Leg Score	89.70°	2
	Force / Load Score	-	0
B	Upper Arm Score	37.15°	2
	Lower Arm Score	129.53°	2
	Wrist Score	37.53°	2
	Coupling Score	-	0

From the recapitulation of the score A posture and identification of the force/load score of the batik maker when filling the canting tool with the wax then an assessment is made for the score A. Table 10 shows the result of the score A, that is 5.

Table 10. Table A's Score

Table A	Neck													
	1				2				3					
Trunk Posture Score	Leg													
		1	2	3	4	1	2	3	4	1	2	3	4	
		1	1	2	3	4	1	2	3	4	3	3	5	6
		2	2	3	4	5	3	4	5	6	4	5	6	7
		3	2	4	5	6	4	5	6	7	5	6	7	8
	4	3	5	6	7	5	6	7	8	6	7	8	9	
	5	4	6	7	8	6	7	8	9	7	8	9	9	
Posture Score A		Force / Load Score				Score A								
5		0				5								

Likewise, for the recapitulation of score B and identification of the batik maker coupling when filling the canting tool with the wax, an assessment was also carried out for score B. Table 11 shows the result of score B, which is 3.

Table 11. Table B's Score

Table B	Lower Arm						
	Wrist	1			2		
Upper Arm Score	1	1	2	2	1	2	3
	2	1	2	3	2	3	4
	3	3	4	5	4	5	5
	4	4	5	5	5	6	7
	5	6	7	8	7	8	8
	6	7	8	8	8	9	9
Posture Score B		Coupling Score			Score B		
3		0			3		

Then from the results of the score A and also B is an assessment of the score C. The result of the score C is 4. After that, the identification of the Score of Activity is +1 in repeating of small actions range (above 4x per minute). The final step is to do the results of the score C sum with the Score of Activity so the REBA's score is obtained. The REBA's score of the batik maker when filling the canting tool with the wax is 5. Table 12 shows the REBA's score of the batik maker when filling the canting tool with the wax.

Table 12. REBA's Score Table for Batik Maker When Filling the Canting Tool with the Wax

Score A	Table C											
	Score B											
1	1	1	1	2	3	3	4	5	6	7	7	7
2	1	2	2	3	4	4	5	6	6	7	7	8
3	2	3	3	3	4	5	6	7	7	8	8	8
4	3	4	4	4	5	6	7	8	8	9	9	9
5	4	4	4	5	6	7	8	8	9	9	9	9
6	6	6	6	7	8	8	9	9	10	10	10	10
7	7	7	7	8	9	9	9	10	10	11	11	11
8	8	8	8	9	10	10	10	10	10	11	11	11
9	9	9	9	10	10	10	11	11	11	12	12	12
10	10	10	10	11	11	11	11	12	12	12	12	12
11	11	11	11	11	12	12	12	12	12	12	12	12
12	12	12	12	12	12	12	12	12	12	12	12	12
Table C Score	Activity Score						REBA Score					
4	1						5					

The REBA's score of the batik maker when filling the canting tool with the wax is 5 which means it is included in the score 4-7. This means that a score of 5 has a moderate or medium risk level and should get improved.

Whereas in the Table 13 below shows a recapitulation of the results that was done.

Table 13. Recapitulation REBA's Score of All Stage Work Activities of the Canting Process

Process	Stage	Work Activity	REBA Score	Risk Level	Preventive Measure
Canting	1	Setting up the stove for melting the wax	5	Medium	Needs to be improved
	2	Filling the canting tool with the wax	5	Medium	Needs to be improved
	3	Scratching the canting on the fabric	5	Medium	Needs to be improved

4. Conclusion

According to the outcomes of research, it is known that the results of the risk level assessment of all stages of the canting process activity have a REBA's score of 5. This means that all stages of the canting process activities including the level of risk are medium with action that needs to be improved. The improvement proposal given to the company is to improve the work facility of the canting process so that it can reduce musculoskeletal complaints and bending posture on batik maker.

From the assessment outcomes of working posture of batik maker using the REBA method, it is then taken into consideration in making improvements by making a proposed design of work facilities including batik chairs, stove tables and barriers by taking into account the anthropometric size of the batik maker's body so that it can minimize the bent work posture experienced by batik maker. Then the results of the proposed work facility design that have been made will be applied to Batik Tulis Tengah Sawah and an assessment of the working posture of batik maker using REBA is carried out after repairs are made.

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