Work Posture Analysis using WERA and NERPA Methods in Batik Workers

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Abstract:

This assessment is driven on workers making Batik Cap texture at Batik Oguud Kampoeng Batik Laweyan Surakarta. The gathering technique is so far manual with unnatural work positions and dull advancements, causing fights of musculoskeletal issue. The explanation behind this examination is to separate work present and ergonomic peril factors in making Batik Cap. During the time spent making Batik Cap there are nine work stations with eighteen activities including eighteen work positions. This examination uses the Workplace Ergonomic Risk Assessment method and the Novel Ergonomic Postural Assessment procedure. The result of the assessment from the assessment using the Workplace Ergonomic Risk Assessment strategy shows that sixteen work practices have a medium peril level. At that point the eventual outcome of the assessment using the Novel Ergonomic Postural Assessment procedure on seventeen work practices shows that there are two work practices in peril level second, there are four work practices in peril level 3, and there are 11 work practices in peril level forth. Recommendations made to diminish the threat of most significant digit and diminishing Novel Ergonomic Postural Assessment scores is improving work positions, updating workplaces, and giving assistive contraptions as brushes, sticks, and tables.

*Keywords:*Batik Cap, NERPA Method, WERA Method, WMSDsor.

I. INTRODUCTION

Batik is one of the makers of batik that makes Batik surface in a methodology for Cap. Batik Cap work stations, expressly hiding blending stations, disguising stations, wandering stations, hiding locking stations, failing horrendously stations, drying stations, shed stations, washing stations, and material aggregating stations. The vast majority of the handles the work stations are as of not long ago done physically and more than once. Mixed up work act is considered in danger for muscle hurt which can incite objections of musculoskeletal issue. Assessments of it in different sorts of adventures have been done and considers show that the muscle part that is as frequently as conceivable whimpered of is skeletal muscle which melds the muscles of the neck, shoulders, arms, hands, fingers, back, waist, and lower muscles. Among the grievances of the skeletal muscle, which is experienced by different laborers is the paunch muscles [1].

Disarranges of most huge digit are related to work and general medicinal issues. it begin to spread extensively on workers in making countries. Its ordinariness vacillates from 15 to 42% [2] generally raised in easygoing authorities. it that occur around 65% of workplace disasters and have gigantic fiscal and social impacts [3] realize reduced quality and work proficiency. it are more common among women than among men [4]. Notwithstanding the way that individuals may have a comparable action title, in spite of all that they don't play out a comparable kind of work assignments [5]. Today, women are in all likelihood more routinely displayed to dull repetitive, and overpowering work endeavors than men, for instance restorative administrations staff, assistants, cleaners, and sewing machine managers [6]. Danger factors for it much of the time occur being developed emphases, overpowering exceptional main jobs, vibrations, and awkward positions [3], manual material

managing [2], and foolish lifting strategies [7].As per [8] the comprehension of ergonomic hazard factors at first incorporates work stations, apparatuses, gear, work techniques, workplace, singular attributes of laborers, metabolic needs, physical pressure, and passionate pressure. Understanding ergonomic hazard factors is significant on the grounds that there indicate it in the upper and lower appendages of the legs and arms. Laborers who have it issues are exhorted by scientists to supplant the manual work technique utilizing a heap lifting help.

Musculature issue are among the most genuine outcomes of ill-advised business related musculoskeletal burden [10]. Side effects of its are characterized as agony in at least one areas of the body. Collected minor wounds that outcome from rehashed long haul business related burden can be viewed as the fundamental driver of its. Research affirms a connection between musculoskeletal burden communicated as an element of parameters that portray stance, power and time groupings, and the frequency of its. This implies a reasonable outstanding burden can lessen the danger of creating its. Bio-mechanical factors, act and applied power are the most significant documented factors identified with the workstation. Time successions of burden are significant. That is the reason it is so critical to effectively providing evaluation of that heap on the premise of bio-mechanical factors and the strategies this should be possible with.

In this manner, an examination is expected to investigate the work pose so as to realize the hazard components of work stance and make upgrades to limit the danger of damage.

Evaluation process: It do utilization of nine mixes, to be specific, mix of shoulder pose with shoulder redundancy, wrist pose with wrist reiteration, back stance with back reiteration, neck act with neck redundancy, leg pose with term of work, quality with back stance, danger of

vibration with wrist act, contact worry with wrist stance, and span of work with quality [12].

The novel postural assessment method methodology strategy: It is an ergonomics method that is used to analyze and to assess work acts in the chest region. National Electric Power Regulatory Authority is a change of the Rapid Upper Limb Assessment [8]. The novel postural assessment method methodology method presents changes to the arms, neck, back, and wrist parts, yet simultaneously keeps up tables A, B.
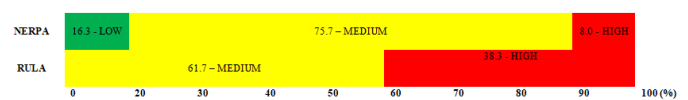

Figure 1. Comparison chart [8]

The exploration was done by [13] utilizing the novel postural assessment method strategy which is appropriate for the structure of item forms created with 3 dimensional Computer aided design and utilized in aviation and the car business. The outcomes indicated that there were factually noteworthy contrasts with the broadly utilized Rapid Upper Limb Assessment technique. Research utilizing the novel postural assessment method, these two strategies has been done by [14]. Respondents were 455 representatives working in the pharmaceuticals, printing-endorsement, and milk-refreshment maker's area. Novel postural assessment method is a legitimate device contrasted with Rapid Upper Limb Assessment. The novel postural assessment method strategy can be utilized to finish work that stands in different businesses. The ergonomic appraisal strategy novel postural assessment method will improve the structure procedure, expanding the potential for ergonomic upgrade of different elective plans completed as a major aspect of a constant improvement cycle all through the distinctive item life cycle stages [13].

Research using the Open Web Application Security Project has been finished by [15] .The delayed consequence of the Open Web Application

Security Project (methodology shows that there are two perilous activities and necessities improvement now, for instance the development of embeddings zinc into a press machine, and the activity of putting zinc containing sohun noodle into first drying dan the outcome of the WERA system exhibits that all activities are associated with the medium level exercises with the objective that further assessment and change is needed. While investigate in the Batik business has been finished by [16] to be explicit ergonomic evaluation using the PATH procedure as repeat of time presentation level and Open Web Application Security Project (strategy is a work chance grouping as action level. Various assessments [17] the object of research is five authorities with an extent of 48-64 years of age who work in the top printing process.

The point of this exploration is to discover ergonomic hazard factors in the work environment utilizing the Western Eastern Roadracers Association and a novel postural assessment method strategies and to give proposals to improving work forms that have the most risky dangers.

II. RESEARCH METHODOLOGY

The investigation was led on Batik Cap generation laborers. The investigation test was taken on eight specialists, male sex with an age scope of 25-55 years.

Research Steps:

Gathering information, to be specific: (1) the Western Eastern Roadracers Association strategy comprises of six physical hazard factors including stance, reiteration, quality, vibration, stress contact, and length of work and includes five principle body parts specifically shoulder, wrist, back, neck, and legs. (2) The a novel postural assessment method strategy incorporates act

Processing data using Western Eastern Road racers Association processing

Stage 1 is choosen nine physical risk factors, to be explicit: (1) Assessment of shoulder chance factors involves shoulder position and emphasis of the shoulder sections. (2) Assessment of wrist chance components contains wrist position and emphasis of the wrist part. (3) Assessment of back danger factors contains back position and repetition of the back. (4) Assessment of neck go out on a limb position and emphasis of the neck. (5) Assessment of foot factors includes legs position and length of work. (6) The assessment of solidarity peril factors contains the lifted weight and the back position. (7) Assessment of vibration chance parts includes the length of vibration presentation on the contraption used and wrist present. (8) An assessment of stress contact risk factors involves a dealing with equipment or gloves and wrist present. (9) Assessment of the term of work factors includes length of work and quality.

At levelsecond, is pick the structure scoring in the entirety of the nine physical risk factors utilizing the WERA scoring framework table. At third level, is adapting last by and large score. At last sort out fourth is pick activity level class.

Handling information utilizing NERPA strategy

Stage 1 is decide the scope of work acts specifically bunch An (upper arms, fore arms, and wrist) and gathering B (neck, back, and legs). At that point stage 2 is decide the weight and the utilization of muscles in work exercises. Stage 3 is gathering body part scores, weight, and muscle use in work exercises. At long last stage 4 is decide activity level classification.

III. RESULT AND DATA ANALYSIS

The way toward making Batik Cap comprises of nine work stations with 18 exercises, clarified in Table 1. The work station starts with the procedure of shading blending, coloring, shading locking, stepping, fading, washing, shed, drying lastly is fabric stockpiling.

Table 1: Workstations

Count	Process name	demonstraton
1.	Coloring process	Dozing of colored drugs with proper water mixture
2.	To die	Smoks
3.	Lock color	Water glass's Addition,removal of clothes
4.	Stamp work	Cut off wax,Stamp work
5.	Bleech process	Using chlorine water,soak enormous clothes alongwithdip,inspect and cleansing process
6.	Wash-off	Wax water rub
7.	Shedding	Lift the dipped off clothes
8.	Dry -off	Proper drying out cloth and put it off
9.	Proper storing	Bifold clothes

In this examination, information preparing utilizing 2 techniques, to be specific Western Eastern Roadracers Association strategy dan novel postural assessment method methodology technique. The

examination completed was on the smoks action of the coloring work station. Since in these exercises laborers do their work on the floor, hunching down, dull and for quite a while. It is demonstrated that there is a danger of low back agony.

Smoks Activity

At shading work stations smoks action is done physically. The development is to squeeze the fabric. The action was done over and again in a hunching down position with hands squeezing the texture so the shoulders and lower arms came to advance, back and neck bowed forward.
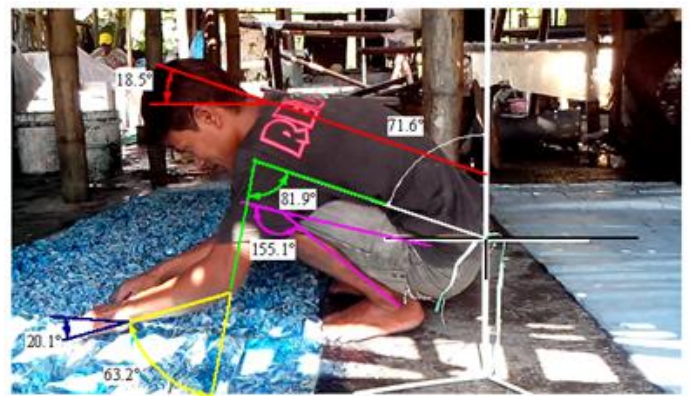

Figure 2. Smoks Activity

At shading work stations smoks action is done physically. The development is to squeeze the fabric. The action was done over and again in a hunching down position with hands squeezing the texture so the shoulders and lower arms came to advance, back and neck bowed forward.

Table 2. Obtained Conclusion

Real world	Factoring of risk	Description	Risk Level		
			lower	between	max
Shoulder	Posturing	82, 8°		y	
	Re-attempting	On going process			y
Wrists	Posture	20,1 °			y
	Re-attempting	92 rpm			y
Back	Posture	71,6 °			y
	Re-attempting	9 Trpm			y
Neck	Posture	18,5 °		y	

	Re-attempting	On going process			y
Legs	Posture	155,1 °			y
	Re-attempting ork	Approx. 3 hour		y	
Strength	Strength	0-5 Kg	y		
	Re-attempting	75,8 °			y
Vibration	Vibrating speed				
	Posturing	25,2 °			y
Stress Contact	Note down stressing	without gloves			y
	Posturing	25,2 °			y
Duration of work	Re-attempting	Below than 3 hours		y	
	power	Up to five kilo	y		

proper degree for duration of work, stress contact, vibration, strength, legs, neck, back, wrists, shoulder are as :ranging from 3 hours,25,2 degree,75,8degree.155,1 degree ,18,5 degree,71,6 degree,20,1 degree,82,8degree .For each ofut, the long, medium, high value as denoted in the below table with value initated from 3 and being ended at 7 along with enormous factors.

Table 3. Obtained marks

	Shoulder Factor					Wrists Posture					Back Posture			
Repetition	Risk Leve	Long	Medium	Hhi	**Repetition**	Risk Leve	Long	Medium	H	**Repetition**	Risk Leve	Long	Medium	High
	Long	3	4	5		Long	3	4	5		Long	3	4	5
	Medium	4	5	6		Meduim	4	5	6		Meduim	4	5	6
	High	5	**6**	7		High	5	**6**	7		High	5	**6**	7
	Neck Posture					Legs Posture					Strength			
Repetition	Risk Leve	Long	Medium	High	**Duration of**	Risk Leve	Long	Medium	High	**Back Posture**	Risk Leve	Long	Medium	High
	Long	3	4	5		Long	3	4	5		Long	3	4	5
	Medium	4	5	6		Medium	4	5	6		Medium	4	5	6
	High	5	**6**	7		High	5	**6**	7		High	5	**6**	7
	Vibration					Stress Contact					Duration of Work			
Wrists	Risk Leve	Long	Medium	High	**Wrists**	Risk Leve	Long	Medium	High	**Strength**	Risk Leve	Long	Medium	High
	Long	3	4	5		Long	3	4	5		Long	3	**4**	5
	Medium	4	5	6		Medium	4	5	6		Medium	4	5	6
	High	5	**6**	7		High	5	**6**	7		High	5	6	4
Total Score													**42**

Based on the results of table 3, the action level with a total score of 42 is at the level of medium risk which indicates that the task needs further investigation and changes are needed.

IV. NOVEL POSTURAL ASSESSMENT METHOD

All the process is divided in 3 main categories such as A,B,C.The total scoring was provided fro m 1 to 9 deepnding on the

ranging and well illustrated in the below table with mentioning 12 vertices such as table a,activity,wrist,upperarm.The maximum score were 8 and denoted as the final values .Unit value is given to the wait and row c value was at second highest.WRIST position is possible at score of 2.Neck is being occupied with score of 3.

Table 4. Assessment:

Count	Position of Body Parts	Description	Scoring
1.	Upper arms	Upper arms position will provide as maximum count of score up to 5 ,rest position is being handled by others	5
2.	Forearms	Its position will provide as maximum count of score up to 2 ,rest position is being handled by others	2
3.	Wrists	Wrist position will provide as maximum count of score up to 4 ,rest position is being handled by lower parts others	4
4.	Wrists Rotation	Moving wrist with rotation $<75\,°$ to obtain more value than unit value	2
5.	Table A	The table value of AI is taken from the coordinates of a straight line from point no. 1, 2, 3, 4 provide 4+ score ,obtained 5	5
6.	Activity	Activity position will provide as maximum count of score up to 2 ,rest position is being handled by others	2
7.	Weight	Weight position will provide as maximum count of score up to 1 ,rest position is being handled by others	1
8.	Column C Value	Column C Value position will provide as maximum count of score up to 6 ,rest position is being handled by others	6
9.	Neck	Neck position will provide as maximum count of score up to 3 ,rest position is being handled by others	3
10.	Back	Back position will provide as maximum count of score up to 5 ,rest position is being handled by others	5
11.	Foot	Foot position will provide as maximum count of score up to 2 ,rest position is being handled by others	2
12.	Table B	Table B position will provide as maximum count of score up to 6 ,rest position is being handled by others	6
13.	Activity	Activity position will provide as maximum count of score up to 2 ,rest position is being handled by others	2
14.	Weight	Weight position will provide as maximum count of score up to 1 ,rest position is being handled by others	1
15.	Row C	Row C Value position will provide as maximum count	7

	Value	of score up to 7 ,rest position is being handled by others	
16.	Final score	Final score position will provide as maximum count of score up to 8 ,rest position is being handled by others	8

Data Analysis and Discussion

The novel postural assessment method methodology evaluation is being classified into three mainly lead affairs, known as A,b,c.

Count	Work Stations	Activity	Western Eastern Roadracers Association		novel postural assessment method	
			Score	Level	Score	Level
1.	Mixing of color	1.1. Coloring the drugs dose	32	C	4	2
		1.2. Coloring the drugs and mix the water	36	C	3	2
2.	To -Dye	2.1. Smoking	45	C	7	4
		2.2. *Penutulan*	43	C	7	4
3.	Lock the particular color	3.1. Addition of water glass	33	C	-	-
		3.2. remove the cloth	31	C	5	3
4.	Stamp work	4.1. cut the Wax cut	37	C	5	3
		4.2. Stamp work	39	C	7	4
5.	Bleach treatment	5.1. Soak clothing inside chlorine water	38	C	7	4
		5.2. Dipp the cloth inwater	39	C	7	4
		5.3. to Inspect and clean the clothing towards water	35	C	7	4
6.	Wash process	6.1. *Mewiru*clothing	36	C	7	4
		6.2. Rubb the waxed clothing	39	C	7	4
7.	Shedding	7.1. Dipp the clothing within lifting it up	30	C	5	3
8.	To Dry	8.1. Sowsoda	36	C	7	4
		8.2. Dry aiding cloth hang	30	C	5	3
		8.3. Pull cloth b/w bamboo	-	-	7	4
9.	Storing the Cloth	9.1. fold the Cloth	-	-	7	4

Considering the outcome of the novel postural appraisal strategy method for 18 activities in nine work stations, it shows that there are three work practices that are at the level of three risk , there are four activities that are at the level of danger third , and there are eleven activities that are at the peril level forth. Table 5th shows that activities done by overseers needs further research and make a move now since they have a last score of total seven which is at the level of peril forth.

Proposals for Improvement on Smoks Activity

The outcome of the estimation of the novel postural assessment method methodology in the smoks enhancing is at the level of peril 4 within the final scoring 8. This activity has a high ergonomic hazard. The total scoring was provided from 1 to 9 depending on the ranging and well-illustrated in the below table with mentioning 12 vertices such as table a activity,wrist,upperarm.The maximum score were 8 and denoted as the final values .Unit value is given to the wait and row c value was at second highest. WRIST position ispossible at score of 2.Neck is being occupied with score of 3 with each proper degree measurement

V. CONCLUSION

The route towards building Batik has totally nine working - stations with 20 activities and 20 positioning inside it. The eventual outcome of this system is 15 work practices with middle danger leveling to assess and do variations are being in requirement form. The result of the a novel postural assessment method methodology is that there are 2 activities in peril level 2nd and 4th activities in risk level 3, and 11 activities in threat level 4. Recommendations made to diminish the risk of Most Significant Digit and provide reduction a novel postural assessment methodology does scoring are Do enhancement of working present, redesigning working condition, providing instruments as brushes, sticks, and tables.

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