



Analysis of Postures Towards Musculoskeletal Disorders Experienced By Batik Artisans of Sukamaju Giriloyo Yogyakarta

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Abstract

Batik artisan tends to bend his neck while using a tool called canting to make batik fabrics for long hours (approximately 12 hours). Viewed from the health perspective, working in such position for long hours may cause abdominal muscles to be inelastic, bent spine and strained eye muscles. Health disorders are cumulative and if left alone for long period they will get worse, impair health and reduce work productivity. Batik artisans may produce batik fabrics in great amount but their long term health tends to be overlooked. Therefore, this study was aimed to analyze the effects of muscle overstretch (weight factor) and unnatural work posture (unnatural posture factor) on Sukamaju batik artisans in Giriloyo village, Yogyakarta. This study employed a mixed method of the regression test and descriptive explanation. The research results show that unnatural work posture and muscle overstretch (weight factor) may cause musculoskeletal disorders on written batik artisans of the Sukamaju batik artisan community in Giriloyo village.

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INTRODUCTION

The advancement in industrial sectors has been increasing both in small and big industries. Batik industry is one example where it has been developing rapidly both domestically and internationally. In 2009, batik was considered as international heritage by UNESCO (United Nations Educational, Scientific and Cultural Organisation). From that point, batik has been in high demand. In Indonesia, there are numerous batik centres. One of famous batik centres is located in Giriloyo, Wukirsari village, Yogyakarta city. Giriloyo is located in Imogiri Sub-district, Bantul District, which is located more or less 17 km north of Yogyakarta. According to Dhari (2017), batik artisans use two methods in making batik fabrics, namely printing and writing. Batik artisans tend to bend their necks while their hands are holding canting (small tool for drawing batik patterns on cloth) for long hours (approximately 12 hours). Viewed from the health perspective, working in such posture for long hours may cause stomach muscles to be inelastic, bent spine and strained eye muscles. Such postures, when not accommodated with a specifically designed stool which allows free movement or view, may cause disorders on spine, kidneys and eyes (Kuswana, 2014). While drawing batik, batik artisans also may stand for a long time. Standing for a long time may cause people to adjust body balance, thus adding more pressure on the back and feet muscles. Such posture may also direct blood flow to the lower part of body (Dryastiti, P.E, (2013)). Energy is more consumed when batik artisans work in physiologically unnatural postures (Takahashi, 2002). A research performed by ILO enlists the accidents and diseases caused during work: musculoskeletal disease (40%), heart disease (16%), accidents (16%) and respiratory tract disease (19%) (ILO, 2013). Cumulative health disorders in long period will impair health and reduce work productivity (Andrian & Deni, 2013). Batik artisans must produce batik fabrics in great amount to meet the high demand but their long term health are overlooked. But in

general, one of the problems faced is the problem of work health and safety that still tends to be ignored by the batik artisans. However, this problem is very important to ensure that the batik artisans can work safely, comfortably, and healthy. accidents and disease that caused by work occur because of the presence of sources of danger in the work environment. The result of field observation of Indonesia Islamic University team at Batik Tulis Kebon Indah Group identified that there are some danger potentials which at the same time become problems in the batik activity process (Muafi,2019). According to the data collected by the Health Ecology Research and Development Centre of Health Department, which involved 800 people from 8 formal sectors in Indonesia, lower back pain were experienced by 31.6% of palm oil farmers in Riau, 21% of shadow puppet artisans in Yogyakarta, 18% onix artisans in West Java, 16% of gold diggers in West Kalimantan, 14,9% of shoemakers in Bogor and 8% of brass artisans in Central Java, brickmakers in Lampung (76,7%) and fishermen in Jakarta (41,6%) (Heri, 2013). Data from Imogiri clinic also show that 67,7% of batik artisans suffer musculoskeletal disorders (MSDs) on their necks, right part of their backs and waists (Anjani dkk, 2013). A preliminary study conducted by the researcher on 6 batik artisans shows that they suffer pain in the back, neck and shoulder. The pain may be caused by their daily working posture as batik artisans in Giriloyo village, Yogyakarta. As also revealed in Dhari (2017), the result of REBA (Rapid Entire Body Assessment) on the work postures of batik artisans in the village who produced Toppo HP branded batik is 9. This means that the work has high risk of musculoskeletal disorders and therefore requires immediate intervention. The disorders in long period may reduce productivity, waste work time and cause greater health treatment costs (WHO, 2010).

Work postures are closely related to ergonomics (Humantech, 2012). Ergonomics comes from latin word *ergon* which means work and *nomos* which means law. Ergonomics can be defined as a study of human aspects in their

work environment regarding anatomy, physiology, psychology, engineering, management and design (Nurmianto, 2008).

Ergonomics aims to improve physical and mental wellness through prevention of injuries and diseases due to bad postures and reduce work load (J Nieves Serratos-Perez, 2015). Musculoskeletal disorders (MSDs) are injuries and disorders in the musculoskeletal system. Studies recorded in international literature has revealed the high prevalence of MSDs (Moshavee et al., 2015). In order to understand which work postures are effective and efficient, we should conduct research and learn ergonomics. By doing them, we may analyze and evaluate bad postures and recommend better postures. Work posture must come to our attention since it is directly linked with the operation process itself (Ivaniria Tecilla Guimarães Souza, 2015).

Musculoskeletal disorders include injuries in muscles, nervous systems, tendons, ligaments, joints, cartilage or spinal disk. MSDs may be caused by momentarily or acute events such as slipping, long travel or falling down (Wardhaningsih, 2010). MSDs tend to occur on workers from certain industry sectors such as transportation, warehousing, export/import, health treatment and social supports, farmers, forestry officers, fishermen, construction workers, social services, artists, entertainment and recreation (Luenda E. Charles, 2017).

According to Rizka (2012), musculoskeletal disorders are disorders on skeletal muscles which are caused by repeated, continuous static loads on skeletal muscles for long period, damaging joints, ligaments and tendons.

Several factors which cause skeletal muscle complaints are weight and muscle overstretch in doing physical activities such as lifting, pushing and holding weight loads. Muscle overstretch occurs because energy usage is bigger than muscle's capacity (Sumadi, 2000). Repeated activities (frequency factor) with little variation may cause fatigue and tension in muscles and tendons. Without adequate relaxation, inflammation may occur in them. The inflammation increases pressures

on the nerves. Unnatural work postures (unnatural posture factor) are postures that cause body parts to move unnaturally, such as upward hand movement, the back bends too much, the head looks up etc (Suma'mur, 2009). The farther body parts move from their natural movement, the higher the risk of skeletal muscle complaints will be. Unnatural postures are often performed due to the work demand, equipment usage and work stations which are not in line with worker's capability and limitation (Manuaba, 2000).

Secondary cause factors: 1. Pressure on the soft muscle tissues. For example, when hand holds a tool, the soft muscle tissues will receive pressure from the tool. If this situation is repeated many times, it will cause pain in the associated muscles. 2. High frequency vibration will increase contraction in muscles. Static contractions will disturb blood flow, increase lactic acid build up and eventually cause muscular pain (Suma'mur, 2004). 3. Microclimate. Excessive exposure to cold temperature may decrease agility, sensitivity and durability, causing worker to move in slowed rate with difficulty and have decreased muscle power (Rizka, 2012). 4. Age. Musculoskeletal complaints may occur during the working age, from ages 25 to 65. The symptoms generally are experienced in age 35 and keep increasing. It is because during the middle age phase, muscle's power and durability tend to decrease (Dryastiti, 2013). 5. Gender. It affects the risk level of muscle complaints. Physiologically, women's muscle power is weaker than men's. The prevalence of the most disorders in women is higher and prevailing than in men (with ratio 3:1) so that women's muscles durability to work is lower than men's. 6. Smoking habit. The longer and higher the frequency of smoking habit is, the higher muscle complaints will be experienced. Smoking habit may reduce the lung's capacity to absorb oxygen. People with smoking habit will experience muscle fatigue sooner when working with heavy loads. 7. Fitness. Muscle complaints seldom happen to workers who have adequate relaxation time. But some workers have night shifts which reduce their

rest time. Low fitness will increase the risk of muscle complaints. 8. Physical strength. Each person is born with different physical strength. Some people are stronger than others. People with weaker physical strength will be likely to experience muscle injuries when receiving work loads which are same with the stronger people's work loads. 9. Body size (anthropometry). Musculoskeletal complaints related to body size are caused by the imbalance of skeletal structure in receiving body weight and other objects it carries.

Unnatural postures which are performed in long period will cause skeletal muscle disorders and other problems, reducing production process (Kroemer, K.H.E., and E, Grandjean, 2005). Work physiology is defined as a discipline which investigates and applies physiologic process of human during work. Physiologically, when a man does his work, there are coordinations taking place in his body's systems such as sensory systems, musculoskeletal system, nervous system etc. There are factors which influence work process such as work load, body organs, time and workplace. They may cause people to experience change physiologically (Oesman, T.I., Yusuf, M., & Irawan, L. 2012).

Work posture is the determining point in analyzing effectiveness of work. When the posture of a worker is good and ergonomic, his outcome will be good also. However, when his posture is not ergonomic, he will get tired easily, resulting in reduced outcome (Susihono, 2012).

Work posture is classified into several types. The first is sitting. Sitting while working for long period may cause musculoskeletal problems especially in the back since there are pressures on the back. According to Mahfud (2014), the sitting posture reduces static load on feet and energy consumption. Sitting consumes lower energy than standing does. However, the pressure on the back while sitting is higher than standing or lying down. Let us assume normal pressure is 100%. When one sits in erect posture, he will receive 140% pressure and 190% pressure if he sits with the body bending forward. The sitting position with the back

erect requires muscle activities in the back more than the sitting position with the body bending forward. The pressure on the back should be directed to the back of chair in order to reduce pain and fatigue (Siswiyanti Dan Saufik Luthfianto, 2011).

The second is standing posture. The standing posture signifies readiness both mentally and physically. The posture allows activities to be undertaken faster and with more power and accuracy. However, the standing position may cause tiredness, pain and even fracture in the spine (Manuaba, A. 2000).

The third is sitting-standing posture. This posture is a combination of the previous postures. It is performed to reduce muscle fatigue due to forced work posture.

This combination is better than the sitting and standing only postures. The implementation of sitting-standing posture provides benefits to industry sectors where pressure on the spine and waist are 30% lower than the pressure while in the sitting or standing only positions (Tarwaka, 2010).

Based on the survey and review above, this study therefore attempts to analyze ergonomic factors which influence musculoskeletal disorders experienced by batik artisans in the Sukamaju batik community in Giriloyo "batik" village, Yogyakarta.

METHOD

This study employed a mixed method of regression test and descriptive explanation (Sugiyono, 2018).

Population And Sample

Samples used in this study were 67 Sukamaju batik artisans in Giriloyo village. They were selected using the saturated sampling method.

RESULTS AND DISCUSSION

The results of validity and reliability tests show that the question points are valid because t count is higher than t table. Furthermore, all

variables are reliable because the score of Cornbach Alpha is higher than 0,6. Based on the regression table, the double linear regression equation is formulated as follows:

Table 1. Multiple linear regression analysis

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	
	B	Std. Error	Beta			
	(Constant)	.475	1.456	.327	.745	
1	X1	.273	.101	.245	2.703	.008
	X2	.210	.104	.168	2.026	.046

$$Y = 0,882 + 0,120 X1 + 0,500 X2$$

Table 2. Hypothesis test I

Model	Sum of Squares	Df	Mean Square	F	Sig.	
1	Regression	864.205	2	288.068	45.936	.000
	Residual	564.401	64	6.271		
	Total	1.428.606	66			

From the equation it can be concluded that: Constant (a) is 0,475, meaning it is without unnatural work posture variable (X1 and muscle overstretch (X2) = 0. Therefore the value of musculoskeletal disorders variable is 0,475.

The coefficient regression of unnatural work posture (b1) is 0,273, indicating that every one unit increase in unnatural work posture will result in increase in worker's musculoskeletal disorders for 0,273 unit with other variables remain same or *ceteris paribus*.

The coefficient regression of muscle overstretch (b2) is 0,210, indicating that every overstretch muscle for one unit will increase worker's musculoskeletal disorders for 0,210 unit with other variables remain same or *ceteris paribus*.

Hypothesis I testing

Hypothesis I that "Unnatural work posture affects musculoskeletal disorders on the batik artisans of Sukamaju community in Giriloyo Village, Jogjakarta" **is accepted.**

Hypothesis II testing

Hypothesis II that "muscle overstretch (weight factor) affects musculoskeletal disorder complaints on the batik artisans of Sukamaju community in Giriloyo village, Jogjakarta" **is accepted.**

The Model Feasibility Testing using F test from Anova table shows that the significance score (0,000) is smaller than 0,05 (5%) and the F value (63,657) is higher than the F value in F table (3,14).

Table 3. Hypothesis test II

Model	Sum of Squares	Df	Mean Square	F	Sig.
1 Regression	864.205	2	288.068	45.936	.000
Residual	564.401	64	6.271		
Total	1.428.606	66			

Therefore, it can be concluded that unnatural work posture (X1) and muscle overstretch affect musculoskeletal disorders for 0,605 (or 60,5%) while the remaining 39,5% are from other variables outside the study.

Qualitatively analyzed, the risk level of muscle complaint is influenced by gender because physiologically men's muscles are stronger than women's muscles. A person's capacity is directly proportional to his age and peaks at age 25. At ages 50-60, muscle power will be reduced for 25% while sensory motor capability will be reduced for 60%. Work posture of the batik artisans in Giriloyo should be corrected by adjusting the work station in accordance with the anthropometry of the batik artisans.

The usage of chairs and tables specifically designed to make the batik creation process easier can be taken to reduce unnatural, static work postures. Hopefully, the solution may reduce the complaints experienced by the batik artisans who previously sit on stools while working. If their complaints are not fixed for a long period, they will damage their ligaments, joints and tendons, causing musculoskeletal disorders.

CONCLUSION

Based on the results of hypothesis I testing, the "unnatural work posture affects musculoskeletal disorders experienced by the batik artisans in Sukamaju community in Giriloyo village, Jogjakarta".

Based on the results of hypothesis II testing, muscle overstretch affects musculoskeletal disorders experienced by the batik artisans in Sukamaju community in Giriloyo village, Jogjakarta.

The risk level of muscle complaint is influenced by gender because physiologically men's muscles are stronger than women's. Physical capacity is also directly proportional to age and reaches its peak in age 25. During ages 50-60 muscle power will decrease for 25% while sensoric-motor capability will decrease for 60%. The work posture of batik artisans in Giriloyo requires correction and improvement.

SUGGESTIONS

Based on the research results it is recommended for the company that their workers' work posture should be corrected and improved because it belongs to medium and high risk categories. New standard operational procedure based on ergonomics can also be designed and distributed in the workplace so the workers can start implement them. Social contacts may also be established by performing gymnastics before work and playing music during work.

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