

## The Effect Of Work Duration And Work Posture On Low Back Pain In Weavers In Troso Village Rt.1 RW.2 Pecangaan Subdistrict Jepara District

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### ARTICLE INFO

### ABSTRACT

#### Keywords:

Work Duration, Work Posture, Low Back Pain, Weaver

Low Back Pain (LBP) is lower back pain originating from the spine. Low back pain is one of the complaints that can lead to decreased human productivity, 80% of the population in industrialized countries have felt low back pain, the percentage increases with the age of the patient. Based on basic health research in 2018, the prevalence of low back pain in Indonesia varies from 7.6% to 37%. To analyze the effect of work duration and work posture on low back pain in weavers in Troso Village RT.1 RW.2. This study used quantitative methods in the form of analytic observations with a cross sectional approach. The research was conducted on August 26-30, 2023. The sample in this study were weavers in Troso Village RT.1 RW.2, Pecangaan District, Jepara Regency. Sampling using consecutive sampling technique with regard to inclusion and exclusion criteria. The number of samples obtained was 60 people. The analysis used was univariate analysis using descriptive frequency, while bivariate analysis used the spearman rank correlation test. Univariate analysis showed that the majority of respondents with work duration > 7 hours as many as 44 people (73.3%), the results of the RULA work questionnaire category need further investigation, and changes are made if necessary posture as many as 31 people (51.7%), and suffered from LBP as many as 46 people (76.7%). In the bivariate analysis of the effect of work duration on low back pain, the Spearman rank correlation test value  $p = 0.000$  ( $p < 0.05$ ) and the value of  $r = +0.648$ . On the effect of work posture on low back pain, the value of the spearman rank correlation test  $p = 0.021$  ( $p < 0.05$ ) and the value of  $r = +0.297$ . There is a strong influence between work duration and low back pain in weavers in Troso Village RT.1 RW.2. There is a weak influence between work posture on low back pain in weavers in Troso Village RT.1 RW.2.

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### 1. INTRODUCTION

Discomfort in the lower back originating from the spine is known as low back pain (LBP). One of the complaints that can lead to a decrease in human productivity is discomfort in the lower back. 80% of the population in industrialized countries has experienced low back pain, and the percentage increases with the age of the sufferers. Each year, there are various cases of low back pain, ranging from 15% to 45%. The World Health Organization states that developing countries experience 33% of low back pain cases among the population (Sugiarto, 2015).

Based on basic health research in 2018, the prevalence of low back pain in Indonesia varies from 7.6% to 37%. In Central Java, workers aged 40-60 years, 40% of them have experienced low back pain. Risk factors for low back pain include age, body weight, length of employment, duration of work, and body posture. Additionally, manual handling and lifting are the main causes of low back pain. Weavers are susceptible to low back pain due to the use of non-machine looms (ATBM) for an extended period. On average, weavers work 8 hours a day, or even more depending on the targets that need to be achieved. Irregular working hours can cause fatigue in workers, impacting productivity and the quality of woven fabric produced (Hayati KF, Kusuma IF, 2014).

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Common work postures include standing, sitting, squatting, walking, and other postures. Unconsciously doing something wrong can lead to poor working conditions and workplace accidents. Sitting posture is the most risky posture for low back pain because poor sitting positions apply improper pressure to the tissues, resulting in pain (Kumbea, Asrifuddin, and Sumampouw, 2021). Generally, discomfort in the lower back is caused by prolonged standing or bending, especially with incorrect body posture (Tanderi and Hendrianingtyas, 2017). When individuals regularly apply incorrect ergonomic work practices, they are at risk of experiencing discomfort in the lower back (Andini, 2015).

Based on the above background, the author is confident in conducting related research due to a significant interest in the influence of work duration and posture as risk factors for the onset of LBP. Therefore, the researcher will conduct a study titled "The Influence of Work Duration and Work Posture on Low Back Pain in Weavers in Troso Village RT.1 RW.2 Pecangaan District, Jepara Regency."

## 2. METHOD

This study is a quantitative research in the form of an analytical observational study with a cross-sectional method. The research was conducted in August 2023 in Troso Village RT.01 RW.02, Pecangaan District, Jepara Regency. The population in this study is textile weavers in the ikat fabric weaving section in Troso Village RT.1 RW.2, Pecangaan District, Jepara Regency. The sample was selected using consecutive sampling techniques, resulting in 60 samples.

Inclusion criteria for this study are working solely as a weaver, aged 16-65 years, having a work experience of more than 2 years, and willing to be respondents. The exclusion criteria are having genetic spinal abnormalities, not completing the questionnaire, and having excessive body mass index (BMI) and obesity. This study uses univariate analysis and bivariate analysis using the Spearman rank test. Ethical approval for this research has been obtained from the Research Ethics Committee of the Faculty of Medicine, Universitas Muhammadiyah Semarang, with approval number 043/EC/KEPK-FK/UNIMUS/2023.

## 3. RESULT AND DISCUSION

### Univariate Analysis

**Table 1.** Respondent Characteristics

Variable	Frekuensi	Percentage (%)
<b>Age</b>		
< 25 Years	13	21,7
26-45 Years	22	36,7
> 45 Years	25	41,7
<b>Gender</b>		
Male	54	90,0
Female	6	10,0
<b>Years of service</b>		
< 6 Years	15	25,0
6 -10 Years	22	36,7
> 10 Years	23	38,3
<b>Working Duration</b>		
> 7 Hours	44	73,3
<= 7 Hours	16	26,7
<b>Working posture</b>		
Immediately changed	0	0
Immediately changed	29	48,3
Medium	31	51,7
Acceptable	0	0
<b>LBP</b>		
Yes	46	76,7

Variable	Frekuensi	Percentage (%)
No	14	23,3
Total	60	100

Based on Table 1, the majority of respondents were over 45 years old, with 25 people (41.7%). The youngest respondent was 16 years old, and the oldest was 65, with a total of 6 people. There were 54 male respondents (90.0%), and the majority had work experience exceeding 10 years, with 23 people (38.3%). The longest work experience was 32 years, and the shortest was 3 years with 6 people. The majority worked for more than 7 hours a day, with 44 people (73.3%). In terms of work posture, 31 people (51.7%) indicated that changes might be needed.

For low back pain, 46 respondents (76.7%) reported experiencing it, while 14 respondents (23.3%) did not experience low back pain, with most of those not experiencing it being under 40 years old.

### Bivariate Analysis

**Table 2.** Spearman Rank Correlation Test for Work Duration vs. Low Back Pain in Weavers in Troso Village

Variable	Low Back Pain				p value	Coefisient Corolation (r)
	Yes		No			
	Frekuensi (N=60)	Percentage (%)	Percentage +0,648	Percentage (%)		
<b>Working Duration</b>					0,000	+0,648
> 7 Hours	41	93,2	3	6,8		
<= 7 Hours	5	31,3	11	68,8		

In Table 2, the correlation coefficient (r) is +0.648, indicating a strong positive correlation, meaning that the longer the work duration, the higher the risk of low back pain. The Spearman correlation test resulted in a p-value of 0.000 (<0.05), indicating a significant relationship between work duration and low back pain. The coefficient of determination ( $r^2$ ) is 0.42, meaning that 42% of the variability in low back pain can be explained by work duration.

**Table 3.** Spearman Rank Correlation Test for Work Posture vs. Low Back Pain in Weavers in Troso Village

Variable	Low Back Pain				p value	Coefisient corelasitio n (r)
	Yes		No			
	Frequency (N=60)	Percentage (%)	Frequency (N=60)	Percentage (%)		
<b>Work Posture</b>					0,021	+0,297
Immediately changed	0	0	0	0		
Immediately changed	26	89,7	3	10,3		
Medium	20	64,5	11	35,5		
Acceptable	0	0	0	0		

In Table 3, the correlation coefficient (r) is 0.297, indicating a weak positive correlation, meaning that the worse the work posture, the higher the risk of low back pain. The Spearman correlation test resulted in a p-value of 0.021 (<0.05), indicating a significant relationship between work posture and low back pain. The coefficient of determination ( $r^2$ ) is 0.088, meaning that 8.88% of the variability in low back pain can be explained by work posture.

### Discussion

In this study, the majority of weavers had a work duration of more than 7 hours (73.3%). The bivariate analysis of work duration vs. low back pain showed a strong positive correlation, indicating that longer work duration increases the risk of low back pain. This aligns with the findings of previous research (Betty Prastuti, 2020) that highlighted a substantial correlation between longer work hours and lower back discomfort.

This research aligns with Betty Prastuti's study (2020), which found a significant correlation, with a P-value of 0.0001 ( $P < 0.05$ ), between the duration of work and lower back discomfort in seamstresses. An odds ratio (OR) of 13.929 was obtained, with a confidence interval (95% CI) of 5.167-37.548. The study's findings indicate that seamstresses working more than eight hours have a

14-fold increased risk of lower back discomfort compared to those working less than eight hours (Prastuti, Sintia, and Ningsih, 2020).

The term "duration" describes how long an employee is exposed to a risk factor. Repetitive movements over an extended period or the use of the same muscles increase the risk of local and overall fatigue in workers. Generally, the longer the work duration, the more time needed for muscle recovery or rest. Workers who exceed the recommended working hours are at risk of fatigue, illness, and accidents, leading to decreased productivity. Work frequency correlates with the physical condition of workers. The function of muscles is affected by intense physical work. Prolonged labor without sufficient rest weakens the body's capabilities and can cause discomfort in various body parts. The Labor Law of 2003 regulates working hours in two different systems: seven hours a day or forty hours a week for six working days a week. Additionally, if you work five days a week, you can work eight hours a day or forty hours a week. To prevent Low Back Pain (LBP), workers can add short rest breaks, such as working for 2 hours followed by a 5-10 minute break by changing body posture (Prastuti, Sintia, and Ningsih, 2020).

The researcher's assumption, based on the study's results, suggests an influence of work duration on Low Back Pain among weavers in Troso Village, District Pecangaan, Jepara Regency in 2023. One significant observation is that most weavers in the Troso Village area are paid based on the price per meter of woven fabric. Thus, there is no established working time requirement.

In this study, the majority of weavers had RULA with a work posture category that needs further investigation and changes if necessary, totaling 31 individuals (51.7%). The bivariate analysis of work posture against Low Back Pain, using the Spearman rank correlation test, resulted in a correlation coefficient ( $r$ ) of +0.297 and a  $p$ -value of 0.021, which is significant as the  $p$ -value is  $\leq 0.05$ . From these results, it can be concluded that there is a relationship between work posture and Low Back Pain. The correlation coefficient  $r = +0.297$  indicates a weak and positive correlation, meaning that the worse the work posture in a day, the higher the risk of workers experiencing Low Back Pain.

This finding is consistent with Betty Prastuti's research (2020), where a substantial correlation was found, with a  $P$ -value of 0.0001 ( $P < 0.05$ ), between the duration of work and lower back discomfort in seamstresses. An odds ratio (OR) of 42.955 was obtained, with a confidence interval (95% CI) of 12.692-145.377. According to the research findings, seamstresses working in a sitting position are 43 times more likely to experience lower back discomfort than those working in a non-risk sitting position (Prastuti, Sintia, and Ningsih, 2020).

The relative alignment of body components in space is called body posture. Muscle effort is required to support or move the body to orient it in a specific timeframe. When working, a person adopts a body posture determined by their body size and the dimensions of various objects in their workspace. Incorrect work posture is one of the factors that endanger oneself while working, causing injuries both quickly and gradually. Body positions or body segments significantly different from standard positions are considered incorrect work postures (Evadarianto, 2017).

Joints and muscles performing an activity are determined by an individual's body posture. Additionally, the magnitude of force or tension generated by a task is also determined by an individual's body position. For example, holding, lifting, and lowering an object when the back is twisted or bent puts greater pressure on the spine than when the back is straight. Moreover, deliveries involving bending or twisting of the shoulders, knees, hips, or wrists exert excessive pressure on muscles and joints, causing discomfort in the lower back (Mandiri et al., 2021).

There are benefits to working in an ergonomic sitting position, such as reducing tension on the legs and decreasing the need for energy and blood circulation. On the other hand, sitting for extended periods can weaken the muscles in the abdomen and cause the spine to curve, making one quickly fatigued. Sitting still and maintaining a static body posture, such as moving little during work, can create greater tension on muscles and tendons, impeding blood flow to affected areas and causing fatigue, numbness, and lower back discomfort (Mokoginta, Pasasa, and Tandiarly, 2020).

To prevent discomfort and fatigue in the back, the chair's support should target the musculoskeletal muscles and spine, especially in the sacral lumbar area and thoracic area around the

waist. Currently, 80% of people suffer from back pain due to various causes, and 40% of these individuals do not go to work every day due to their back discomfort (Ahmad and Budiman, 2014).

#### 4. CONCLUSION

Based on the results of testing with a combination of the FP-Growth and Triple Exponential Smoothing algorithms on sales transaction data, it can be concluded that the results of testing using RapidMiner have been proven to be able to apply the FP-Growth algorithm to obtain consumer spending patterns. 12 association rules were found with the association rules that had the highest lift ratio values being tea and sugar with a lift ratio value of 6,131 Research has contributed to increasing prediction accuracy compared to previous research, test results using Minitab have been proven to be effective implements the Triple Exponential Smoothing algorithm properly, and gives a predicted value in January 2018 of 131.141 Kg with an error testing value of MAPE = 11.7 (MAPE accuracy of 88.3%), MSD = 121.3 and MAD = 52056.5 with a value of  $\alpha = 0.3$  ,  $\beta=0.01$ ,  $\gamma=0.01$ .

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