



**THE EFFECT OF STRETCHING AND ERGONOMIC SITTING POSTURE ON
LOW BACK PAIN (LBP) IN WORKERS**

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ABSTRACT

LBP is the main cause of decreasing work productivity and work absence in most of the big countries in the world. Office employees generally use computers for a long duration with incorrect or non-ergonomic sitting posture. Incorrect or non-ergonomic sitting posture and long sitting duration increase the risk of LBP. Efforts that can be made to control LBP are stretching and ergonomic sitting posture. Objective: the aim of this study is to determine the effect of stretching and ergonomic sitting posture on Low Back Pain (LBP) in workers at PT ADMEDIKA Surakarta. Method: This study used an observational analytical design with a cross-sectional approach. Sampling used a total sampling technique. There were 52 workers who experienced LBP. This study was conducted in PT Admedika Surakarta from April 24 to May 26, 2024. The instrument used the Numeric Rating Scale (NRS) questionnaire. The intervention of stretching and ergonomic sitting posture was 2-3 minutes long for 2 rounds and carried out 3 times per week. The data analysis used a parametric test in the form of a Paired T-test. Results: The results of data analysis obtained a significance value of $0.000 < 0.05$. Conclusions: which can be concluded that there is an effect of stretching and ergonomic sitting posture on Low Back Pain (LBP) in workers of PT ADMEDIKA Surakarta.

Keywords: ergonomic sitting posture; low back pain (LBP); stretching

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INTRODUCTION

The prevalence of LBP according to WHO data (2022) states that musculoskeletal disorders in the world amount to 1.71 billion. The occurrence of LBP is a health problem in the world, including osteoarthritis in 2022 amounting to 528 million people, rheumatoid arthritis in 2020 amounting to 335 million people and LBP in 2022 amounting to 17.3 million people. Asia Tenggara shows a prevalence figure of 369 million with musculoskeletal disorders. Musculoskeletal condylomas are also the largest contributor to disability worldwide with approximately 149 million people living with disability, accounting for 17% of all disability worldwide (Cieza et al, 2020; WHO, 2020). LBP is a major cause of decreased work productivity and absenteeism in most countries worldwide (Nikaputra, 2021). According to RISKESDAS (2021), the prevalence of LBP in Indonesia was 12,914 people or 3.71% of LBP in Indonesia, which is ranked 2nd after influenza. Supported by a collection of Indonesian neurologists in 14 hospitals, it was found that 4,456 people had LBP from a total of 819 visits. Central Java Province, the number of LBP prevalence data from the Ministry of Health in 2018 The incidence of LBP or back pain in Central Java was 314,492 people. It is estimated that LBP is 40% of the population of Central Java aged 20-65 years with LBP prevalence of 18.2% for men and 13.6% for women. Central Java Province has 35 districts (Mastuti & Husain, 2023).

Employees of PT. ADMEDIKA Surakarta, as many as 52 workers experienced Low Back Pain (LBP) due to prolonged sitting with the wrong posture or sitting position, as many as 41 workers experienced LBP that was caused by the wrong sitting position and lack of sports activity in the work environment. The World Health Organization (WHO) said that 2-5% of employees in the industrial sector experience Low Back Pain (LBP) every year, and 15% of these employees are computer operators, lifters, leatherworkers, tailors, and jobs related to back problems (Sakinah in Rahmat et al., 2019). LBP is the main cause of decreased work productivity and absenteeism in most countries in the world. Office workers generally use computers for long periods of time and with awkward sitting postures. Awkward sitting postures and prolonged sitting durations increase the risk of LBP. Awkward working postures cause increased compression of the intervertebral discs which will cause damage to the surrounding tissues. In addition, prolonged sitting durations will cause fatigue of the lower back muscles, resulting in a feeling of pain in the lower back (Nikaputra et al, 2021). Several substantial factors are associated with LBP, including personal factors, work factors, and environmental factors. Occupational factors include workload, work position and duration, while environmental factors include whole body movements and shaking (Maharani, 2020).

LBP complaints are more often felt in individuals with a sitting work posture than in those who work. Workers who work 41-48 hours/week or an average of 7-8 hours per day cause less rest time and heavier muscle work, so that the risk of LBP will increase. Pain can occur due to excessive strain on the muscle attachment to the bone (Firdaus, Bet al., 2020). LBP problems must be addressed especially for office workers so that the level of absenteeism will increase and affect the decline in productivity in the workplace (Agustin. A, 2023). Efforts that can be made to control LBP include the purchase of stretching and sitting postures in reducing the risk of osteoarthritis in the workplace. The general purpose of this study is to determine the effect of the purchase of stretching and sitting postures on Low Back Pain (LBP) in workers at PT. ADMEDIKA Surakarta. The movements include the relaxation and relaxation of bones and joints as well as the relaxation and relaxation of muscles, small blood vessels, fascia, tendons, ligaments, skin, and basal tissue. LBP stretching exercises consist of six movements that last 2-3 minutes and are performed three times a week (Sunaryanti & Trisnowati, 2023). The aim of this study is to determine the effect of stretching and ergonomic sitting posture on Low Back Pain (LBP) in workers at PT ADMEDIKA Surakarta

METHOD

Observational analysis with cross-sectional approach with (Abduh, et al, 2023). The population in this study was 52 workers in eight computers who experienced LBP at PT. ADMEDIKA Surakarta. In this study, the researcher found 41 workers who became respondents and were included in the exclusive crystal with the same intelligence so that the researcher took the entire sample. The sampling technique in this study was total sampling. Total sampling is a sampling technique when all members of the population are used as samples (Sugiyono, 2020). All respondents have been validated and are in accordance with the exclusive criteria. The exclusive criteria of this study are: Computer-operated workers, Workers who experience lower back pain with pain intelligence, Workers who do not consume pain medication for LBP, and respondents who have been respondents for 1 week. The location of the study was PT. ADMEDIKA Surakarta and the time of the survey was carried out on 20-26 May 2024. In the book by Mubarok & Susanto (2015) the survey used the Numerical Rating Scale (NRS). The survey was conducted using a scale of 0-10. Respondents were asked to indicate the scale of the survey on one of the numbers considered most appropriate to describe the survey. Scale 0 is said to be no pain, scale 1-3 is said to be a mild pain, scale 4-6 is said to be a moderate pain, scale 7-9 is said to be a severe pain, and scale 10

is said to be a very severe pain. Data analysis uses the Paired T-Test Test (Gilani, 2021). In this study, the researchers took cases of computerized workers. Based on the explanation above, the effect of stretching and sitting posture on Low Back Pain (LBP) in workers at PT. ADMEDIKA Surakarta, so that efforts can be made to improve work productivity.

RESULTS

Table 1.
Respondent characteristics (n= 41)

Characteristic	f	%
Age		
20-24	20	48,8
25-32	21	51,2
Gender		
Male	8	19,5
Female	33	80,5

Table 2.
Long Sitting (n= 41)

Long of Sitting	f	%
12 Hours	41	100
Total	41	100

Table 3.
Low Back Pain (n= 41)

Low Back Pain (LBP)	Min	Mean	Max	Median	Std. Deviasi
Before	3	4,05	6	4	0,893
After	0	1,44	3	1	0,976

Table 4.
The Effect of Stretching and Ergonomic Sitting Posture on Low Back Pain (LBP) in Workers at PT. Admedika Surakarta (n=41)

	Mean	Frequency	P-Value
Before	4,05	41	0,000
After	1,44	41	

DISCUSSION

Respondent Characteristics

Table 1 above shows the frequency distribution based on age, the majority of whom are 25-32 years old, as many as 21 respondents (51.2%). The results of the study showed that the frequency distribution based on age was the most, namely 25 years old, as many as 11 respondents (26.8%). Research conducted by Febriani (2022) showed that the results of bivariate analysis showed that age factors with lower back pain complaints showed no relationship between age and lower back pain ($p\text{-value } 0.765 > 0.06$). Similar results were obtained in the study conducted by Silitonga and Utami (2024) with the results that there was a significant relationship between age and lower back pain complaints. The results of the study conducted by Nadifatuzzahroh (2024), showed that there was a significant relationship between aging and LBP ($p = 0.001$; $r = 0.396$). According to Nadifatuzzahroh (2024), bone degradation occurs as aging increases and begins when a person is 30 years old. The degradation that occurs can cause tissue damage, tissue replacement, and fluid loss. This can cause decreased stability in bones and muscles. The older the person, the more likely they are

to experience a decrease in bone elasticity which can lead to the onset of LBP symptoms. Silitonga and Utami (2024) state that with increasing age, there will be a bone degeneration process that begins when a person is 30 years old. The process is characterized by the structure of the human intracranial disc that will experience a process that can cause tearing and replacement of tissue with scar tissue, reduced bone fluid, decreased intercellular space and loss of bone cell stability. This can cause decreased fluid in the nucleus. Reduced fluid in the nucleus and static movement will result in decreased ability to withstand loads and pressure. According to the analysis of the discomfort in the lower back area can be experienced by young and elderly people, but it is more severe in the age of 30-60 years and above (Nadifatuzzahroh et al, 2024).

The frequency distribution based on the results of the majority of female respondents, namely 33 respondents (80.5%). The results are in accordance with the research conducted by Zulhamidah (2019), the factors of pain with complaints of lower back pain showed a p value = 0.592 which means there is no relationship. The same results from the research conducted by Febriani (2022) with the results of no relationship between gender and lower back pain (p-value 0.223 > 0.05). The results of the research conducted by Umboh (2020) with the results of the bivariate analysis test, the gender factor with lower back pain complaints showed a p value = 0.592 > 0.08 which means there is no relationship. There are several differences of opinion by experts, but men and women have the same tendency to experience LBP or lower back pain until the age of 60 years (Nadifatuzzahroh et al, 2022). Complaints are felt more often by women, for example, when experiencing menstrual cycles, the physiological factor of women's muscle ability is lower than in men (Mastuti, 2023). Women also have a lifestyle that tends to prefer wearing high heels to fulfill fashion needs and get some benefits to look taller, although high heels cause considerable discomfort. This discomfort is caused because the use of heels can affect the balance of human posture, namely an increase in lordosis which can cause musculoskeletal disorders, one of which is Low Back Pain (LBP) (Macpa and Fathianabila, 2020). According to the analysis of the chair, the activity carried out during work for a long time in the wrong sitting position can cause the work position to be incompatible with ergonomic principles. An improper sitting position can cause the lumbar muscles to contract continuously to maintain body balance.

Long Sitting

Table 2 above shows that all respondents, namely 41 respondents (100%) with a sitting duration of 12 hours. The results of the survey showed that all respondents, namely 41 respondents (100%) with a sitting duration of 12 hours. The results of the survey conducted by Hutasuhut (2021), there was a significant relationship between sitting duration and lower back pain complaints in students of the Faculty of Medicine, Sam Ratulangi University. p value (p < 0.001). The same result is the study conducted by Amin (2023) with the result that there is a relationship between the length and position of sitting with the occurrence of low back pain by students of the Faculty of Medicine, Muslim University of Indonesia, Class of 2019. According to Amin (2023), an idea that says that sitting too long with the wrong position can cause the muscles in the lumbar region to sag. If this is allowed to continue, it can cause damage to the soft tissue and surrounding tissue. Over time, it can cause pressure on the spinal nerve pads, which can result in herniation of the nucleus pulposus. According to Hutasuhut (2021), sitting for 8 hours a day is a risk factor for lower back pain. This is related to back pain and muscle fatigue. Sitting using a computer while studying or working for 2-4 hours is enough to cause discomfort in the lower back area (Hutasuhut et al, 2021). According to Peneliti's analysis when sitting, the body will release a load that is affected by gravity and will cause a pressing force that is in the opposite direction and the same magnitude. Exposure

to the right pressure affects the phylactoid condyles, which results in damage to the spinal cord. This causes a tingling sensation in the lower back.

Low Back Pain (LBP)

Based on the table above, it can be seen that the effect of stretching and sitting posture on Low Back Pain (LBP) is 4.05. After the effect of stretching and sitting posture on Low Back Pain (LBP) is 1.44, from the data above, there is an effect of the working posture on workers. The study conducted by Sumaryanti (2023) with the results of distribution based on the level of the respondents' response in table 2. The results of the effect of stretching and sitting posture on Low Back Pain (LBP) in workers at PT. ADMEDIKA Surakarta obtained by the study showed that there were 3 characteristics of the respondents' response, namely age, sex and sitting duration. The results of the study showed that The frequency distribution based on age was the highest, namely 25 years of age, with 11 respondents (26.8%). The older the person, the more likely they are to experience decreased bone elasticity which can cause symptoms of low back pain (Nadifatuzzahroh, 2024). The frequency distribution based on the results of the majority of female respondents, namely 33 respondents (80.5%). The results of the survey showed that all respondents, namely 41 respondents (100%) with a long sitting duration of 12 hours.

The Effect of Stretching and Ergonomic Sitting Posture on Low Back Pain (LBP) in Workers

Based on the results of the Paired T-Test analysis, the average value of Low Back Pain (LBP) was obtained before with an average value of 4.05 and after the purchase of stretching and ergonomic sitting posture, the average value was 1.44 with a value of $0.000 < 0.05$, so it can be said that there is an effect of the purchase of stretching and ergonomic sitting posture on Low Back Pain (LBP) in Workers at PT. ADMEDIKA Surakarta. The results are not supported by the research conducted by Aswin et al (2023) with a probability value of < 0.001 , meaning that there is an effect of stretching exercises on the incidence of low back pain (LBP) in Batik Craftsmen ($p < 0.05$). Another research conducted by Sunaryanti & Trisnowati (2023), also with the same results, namely there is a variation in the control group between the pre and post-treatment stretching exercises in reducing lower back pain. $p = 0.000 < 0.05$. The suitability of the results is also obtained from the examination carried out by Amin et al (2023), it was found that the p value = $0.000 < 0.05$ was based on the t-test of the degree of pain, namely the difference in the level of pain after treatment. According to Aswin (2023), relaxation with movement helps reduce LBP symptoms. Relaxation at work helps relax the muscles so that they become more flexible, which helps eliminate stiffness, pain, and uncomfortable condylomas at work. Increased oxygen supply and increased muscle mobility and flexibility can improve workplace cooperation, revive worker enthusiasm, and increase flexibility in performing work activities. One of the efforts considered appropriate to prevent increased lower back pain complaints is stretching training, which is an administrative effort to reduce the risk of ergonomic hazards in the workplace. The principle of training in training is to develop the knowledge and skills of workers in preventing the emergence of lower back pain complaints as well as increasing the scope of joint movements.

According to Hadi (2021), the position of sitting on the skeletal muscles (musculoskeletal) and the spine, especially at the waist, must be able to be supported by the back of the chair so that it avoids rolling and getting tired quickly. In the sitting position, the pressure of the spinal column will increase compared to standing or lying, if the sitting position is not straight. If you are not sitting at 100% pressure, your pressure will increase to 140% if you are sitting down and stiff, and your pressure will increase to 190% if you bend over when you are sitting.

Because of this, it is necessary to have a correct sitting posture that can relax (not remain stable). Complaints of LBP are often related to the risk factor of sitting improperly and not being comfortable in the work environment, especially office workers, causing muscle tension and lower back pain or LBP. In a sitting position, improper chair and chair size can also cause a hunched position, thereby increasing the risk of LBP (Agustin, 2023). Physical exercise such as stretching can be done to overcome LBP. Stretching can restore the flexibility of muscles that experience stiffness compared to doing yoga exercises. Normal flexibility affects the dilation of muscle capillaries and blood circulation becomes better and reduces the accumulation of metabolic waste (Arofiati & Sakinah, 2019). The upright sitting position causes an increase in the pressure on the spinal cord pads by 140% and sitting with the body bent forward will cause an increase in the pressure on the spinal cord pads by 190%. This is dangerous for the nerve pads that support the back of the back. The sitting position on the musculoskeletal muscles and spine, especially the waist, must be supported by the backrest of the chair so that it is free from squeaking and quickly tired. In the sitting position, the pressure on the spine will increase compared to lying down or lying down, if the sitting position is not upright. Therefore, it is necessary to have a proper sitting position that can relax (not static) (Hadi, 2021). According to the analysis of the prevention of primer that can be done, namely by carrying out stretching and sitting postures to be carried out in various work places as an intervention that is used to reduce LBP pain which can reduce pain and lower back pain complaints.

CONCLUSION

The influence of purchasing stretching and ergonomic sitting posture can reduce the Low Back Pain (LBP) of workers at PT. ADMEDIKA Surakarta.

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