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The Impact of Workplace Stretching on Reduction of Low Back Pain Complaints Among Undip Library Staff

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ABSTRACT

Low Back Pain (LBP) is a musculoskeletal disorder characterized by pain in the lower back. Office workers engaged in prolonged static sitting are at risk of developing LBP, particularly when adopting non-ergonomic positions. A preliminary study on two staff members of the Library Technical Implementation at Diponegoro University (UNDIP) indicated they were at risk of experiencing low back pain. Prolonged sitting with minimal movement causes muscle tension, reduced joint flexibility, and impaired blood circulation in the lower back, triggering LBP onset.

This study analyzed the effect of workplace stretching on reducing low back pain complaints among UPT Library staff at UNDIP. Using a quantitative approach with pre-experimental design and total sampling method, all 30 UPT Library staff members participated. Data were collected using the Modified Oswestry Low Back Pain Disability Questionnaire.

The Wilcoxon test results showed that workplace stretching interventions significantly reduced low back pain complaints, with $p = 0.001$. The majority of library staff experienced LBP, with 22 individuals (73.3%) reporting symptoms. Most older respondents suffered from LBP, accounting for 19 individuals (95.0%).

Two variables were significantly associated with LBP: age ($p = 0.001$) and years of service ($p = 0.007$). Meanwhile, Body Mass Index (BMI) ($p = 0.657$) and working duration ($p = 0.222$) showed no significant relationship. The findings demonstrate that workplace stretching is an effective intervention for reducing low back pain among office workers performing prolonged sedentary tasks.

Introduction

Occupational diseases consist of various types, one of which is Musculoskeletal Disorders (MSDs). MSDs are complaints due to damage to ligaments, tendons, and joints when muscles receive continuous load (1). The muscle parts that are frequently complained about are skeletal muscles including neck, shoulder, arm, hand, finger, back, waist, and lower body muscles. Among these musculoskeletal complaints, the most commonly experienced by workers is muscle pain in the lower back or low back pain (LBP) (2). Low back pain is a feeling of fatigue, discomfort, or pain in the lower back area with or without symptoms radiating to the legs or limbs. LBP is triggered by a number of factors ranging from internal to external factors (3). Low back pain has a very broad impact not only on sufferers but also on the work environment and social environment, which can result in disrupted work and decreased productivity (4).

Lower back pain is a health problem in almost all countries; 50 to 80% of people aged 20 years and above have experienced lower back pain (5). The National Safety Council reported that occupational diseases with the highest frequency of occurrence are pain or aches in the lower back, accounting for 22% of 1.7 million cases. The incidence rate of LBP in several developing countries is reported to be in the range of 15% to 20% of the total population; this figure shows that approximately one in five people in those regions has experienced lower back pain complaints in varying forms (2). Meanwhile, in Indonesia, according to official data released by the Directorate General of Health Services, Ministry of Health of the Republic of Indonesia in 2024, it was recorded that the prevalence of LBP cases reached 18%, meaning that almost one-fifth of Indonesia's population has experienced this disorder, emphasizing that LBP is one of the musculoskeletal disorders that is quite commonly found and needs comprehensive treatment from prevention, public education, to adequate medical services (6).

The causes of this condition are very diverse, but one of the main factors frequently encountered is excessive muscle stretching resulting from continuous use of back muscles without adequate rest. In addition, lack of stretching or physical activity involving the spine also plays a role in weakening the area. When muscles lose their strength, imbalance in body structure will emerge, which can then trigger more severe muscle tension and even cause postural disorders or long-term injury. Therefore, LBP is not just ordinary pain but a condition that can impact a person's quality of life if not properly treated(1). In general, several factors that can affect complaints include individual factors such as age, gender, race, smoking, and

body mass index; work environment factors such as whole body vibration; work factors such as workload, work position, work duration, body posture, and workplace design; and body movement factors. Lower back pain occurs among workers, especially those with monotonous work routines and static positions for long periods, such as sitting in front of a computer or desk (7).

The results of a preliminary study conducted through interviews with two staff members of the UPT Library at Undip showed they are in the group of workers at risk of experiencing these complaints. Their activities, which are mostly carried out in a sitting position with minimal movement for hours every day, can cause muscle tension, decreased joint flexibility, and impaired blood circulation in the lower back area, which ultimately triggers the onset of LBP symptoms. If not properly addressed, LBP can impact decreased work productivity, increased absenteeism rates, and disrupted overall quality of life. Given the high incidence of LBP among workers, including in academic and administrative environments such as libraries, an effective and easily implementable preventive approach is needed. One intervention proven to have a positive impact in preventing and alleviating LBP is a workplace muscle stretching program or workplace stretching. This method involves a series of movements that can be performed without special equipment and does not require a long time, making it suitable for implementation without disrupting activities. In addition to helping increase muscle and joint flexibility, stretching is also beneficial for reducing muscle stiffness, improving body posture, and increasing blood circulation (2).

Methods

This research is a quantitative study with a Pre-Experimental study design aimed at determining the effect of workplace stretching on reducing low back pain complaints among UPT Library staff at Undip. The population in this study consisted of all UPT Library staff at Undip, totaling 30 people, and the data collection technique used in this research was the total sampling method, so that the entire population became the research sample. The data collection technique was carried out using questionnaires consisting of a respondent identity questionnaire, the Modified Oswestry Low Back Pain Disability Questionnaire (8), and conducting workplace stretching interventions for Undip library staff over 7 sessions (9). Based on previous research, this workplace stretching was performed twice a day, namely at noon and in the afternoon; one workplace stretching session was conducted for 5-7 minutes.

Workplace stretching movements were taken from the Environment Health and Safety University of Toronto and American Journal of Sports Science and Medicine (10). The obtained data were analyzed using statistical methods, namely univariate analysis was conducted to examine the frequency distribution of each variable, while bivariate analysis was conducted using Chi-Square and Wilcoxon tests. This research has obtained ethical approval from the Health Research Ethics Committee with number 197/EA/KEPK-FKM/2025.

Results

A. Univariate Analysis

Table 1. Frequency Distribution of Variables among Undip Library Staff

Variable	f	%
Age		
Young (≤35 years)	10	33.3
Old (>35 years)	20	66.7
Length of Service		
New (≤5 years)	22	73.3
Long (>5 years)	8	26.7
BMI		
Overweight (>25)	17	56.7
Normal (18.5-25.0)	13	43.3
Working Duration		
Normal (≤8 hours)	17	56.7
Overload (>8 hours)	13	43.3
LBP Complaints Pre-Test		
With Complaints	22	73.3
Without Complaints	8	26.7
LBP Complaints Post-Test		
With Complaints	17	56.7
Without Complaints	13	43.3

Based on Table 1, it was found that 20 people (66.7%) were of older age, then the length of service of library staff was dominated by new employees totaling 22 people (73.3%), and for BMI, most library staff were in the overweight category totaling 17 people (56.7%). Furthermore, for working duration, library staff worked in the normal category with a total of 17 people (56.9%), and 22 people (73.3%) had low back pain complaints before the intervention was conducted, and after the intervention was conducted, 17 people (56.7%) had low back pain complaints. This indicates that there is a difference in the number of respondents experiencing low back pain complaints before and after the implementation of workplace stretching intervention.

B. Bivariate Analysis

Table 2. Cross-Tabulation Between Independent Variables and Low Back Pain Complaints Among Undip Library Staff

Variable	Low Back Pain Complaints				TOTAL		p-value
	With Complaints		Without Complaints				
	f	%	f	%	f	%	
Age							
Young (≤35 years)	3	30.0	7	70.0	10	100.0	0.001
Old (>35 years)	19	95.0	1	5.0	20	100.0	
Length of Service							
New (≤5 years)	19	86.4	3	13.6	22	100.0	0.007
Long (>5 years)	3	37.5	5	62.5	8	100.0	
BMI							
Overweight (>25)	13	76.5	4	23.5	17	100.0	0.657
Normal (18.5-25.0)	9	69.2	4	30.8	13	100.0	
Working Duration							
Normal (≤8 hours)	11	64.7	6	35.3	17	100.0	0.222
Overload (>8 hours)	11	84.6	2	15.4	13	100.0	

In Table 2, it is known that among the 30 respondents in the older age group, 19 people (95.0%) experienced low back pain complaints. The results of statistical analysis using the Chi-Square test showed a p-value of 0.001. Thus, it can be concluded that there is a relationship between age and low back pain complaints among Undip Library Staff. Then, the results of the analysis showed that 19 people (86.6%) with new length of service had experienced low back pain complaints. This indicates a relationship between length of service and low back pain complaints as evidenced by a p-value of 0.007. Meanwhile, 13 people (76.5%) of respondents in the overweight BMI category had experienced low back pain complaints. However, based on the cross-tabulation results between BMI and low back pain complaints, a p-value of 0.657 was obtained, which means that the BMI variable in this study is not related to low back pain complaints. All respondents in both the normal and overload working duration categories had low back pain complaints. Respondents who fell into the overload working duration category, totaling 11 people (84.6%), had low back pain complaints. However, based on the statistical test results between working duration and low back pain complaints, a p-value of 0.222 was obtained, which is greater than the significance level of 0.05. It can be concluded that there is no relationship between working duration and low back pain.

Table 3. Test Results of Differences in LBP Complaints Before and After Treatment

	After Treatment – Before Treatment
Z	-3,658[b]
Asymp.Sig. (2-tailed)	0,001

The results of statistical analysis showed that there was a difference in low back pain complaints before and after workplace stretching treatment. A p-value of 0.001 was obtained, which is smaller than the significance level of 0.05. Therefore, it can be concluded that there is an effect of workplace stretching on reducing low back pain complaints among Undip Library Staff.

Discussion

A. The Relationship Between Age and Low Back Pain Complaints

Based on the results of the Chi-Square test conducted between age and low back pain complaints among Undip library staff, it was explained that there is a relationship between age and low back pain complaints. Among library staff, age is one of the factors that influences the occurrence of low back pain complaints. The same finding was found among educational staff at a Catholic University in Manado. This research shows that as age increases, there will be a decline in body functions (11). This condition causes tissue damage, tissue replacement with scar tissue, and reduction of fluid in the joints. This causes bone and muscle stability to decrease. In the older age group, it is often no longer just an occasional complaint, but rather a condition that affects overall quality of life. Decreased stability in bones and muscles makes older respondents reluctant to move, which can ultimately worsen their physical condition (12).

B. The Relationship Between Length of Service and Low Back Pain Complaints

The relationship between length of service and low back pain complaints is a complex relationship and often shows a strong and linear pattern; in other words, the longer someone is in a job, especially work that is physically demanding or involves non-ideal body posture, the greater the risk of experiencing low back pain complaints (13). The analysis results on library staff showed that length of service is related to low back pain complaints with a p-value = 0.007. This is consistent with research conducted on office X staff in South Jakarta. Length of service has a strong relationship with muscle complaints, because the longer a person's work period, the more accumulated minor injuries experienced, which can result in spinal degeneration and cause low back pain. This is caused by loading on the spine over a long period of time. A person's length of service can affect low back pain complaints because workers in an institution who perform the same work patterns or with static postures, if this is done for a long time, will become the main cause of low back pain complaints (14).

C. The Relationship Between Body Mass Index and Low Back Pain Complaints

Statistical test results explained that there is no relationship between Body Mass Index (BMI) and low back pain complaints among library staff. Previous research conducted on UNTAN Rectorate Employees with statistical test results p-value = 1.000 ($p<0.05$), which means there is no relationship between body mass index and low back pain complaints (15). Increased BMI can cause various mechanisms of lower back pain including unintentional injury, causing chronic inflammation that will increase the production of proinflammatory cytokines and acute phase reactants that can cause pain, a close relationship between hypertension and dyslipidemia, and increased BMI is also related to bone degeneration. Excessive BMI causes weak abdominal muscle tone due to fat accumulation, so that a person's center of gravity will be pushed forward and cause increased lumbar lordosis which then causes fatigue in the paravertebral muscles; this is a risk for low back pain. From this, people who are overweight can affect the freedom of movement activities (16).

D. The Relationship Between Working Duration and Low Back Pain Complaints

Based on the chi-square test, results were obtained showing no relationship between working duration and low back pain complaints among Undip library staff. In Indonesia, ideal working hours or normal working time are regulated in Law Number 6 of 2023, which states that ideal working hours are 8 hours per day and 40 hours per week for 5 working days in 1 week (17). A worker who has a short working duration but continuously maintains poor posture, bends while working, or sits with awkward posture for a long period of time, will have a higher risk of experiencing low back pain complaints (18). The same research results were found in previous research; in this study, it was mentioned that workers experience body adaptation to physical workload, where their bodies become more accustomed to heavy loads and certain movements, therefore port workers have a low risk of experiencing low back pain despite long working durations. Duration refers to the amount of time required for workers to be exposed to risk factors. Work that requires the same movements over a long period of time increases the possibility of local and general fatigue. In general, the longer the work period, the longer the muscle recovery or rest time needed (19).

E. Differences Before and After Workplace Stretching Intervention

Based on the results of the Wilcoxon test conducted on Undip library staff, it was explained that there were differences before and after workplace stretching treatment. From these statistical test results, it can be concluded that there is an effect of providing workplace

stretching intervention on reducing low back pain complaints among Undip library staff. The same finding was found in research conducted on SMAN 10 teachers, which showed a decrease in the average lower back pain complaints before and after stretching education. Low back pain can be prevented and its complaints reduced with routine stretching exercises. Stretching exercises help maintain physical fitness, which allows proper distribution of chemicals needed by the body during metabolism and helps maintain elasticity (20). Workplace stretching is recommended for preventing low back pain complaints. Workplace stretching, which is usually done in short sessions, effectively increases flexibility. Stretching movements that focus on the back, hips, and legs help break the cycle of tension accumulated from static posture. In addition, this stretching improves blood circulation to tense areas, bringing oxygen and nutrients needed for muscle recovery, while helping to remove waste products that cause pain (21).

Conclusion

Based on the research and discussion compiled, it can be concluded that there is an effect of providing workplace stretching treatment/intervention on reducing low back pain complaints among Undip Library Staff, with a significance value of <0.05 (p-value = 0.001). Furthermore, there are 2 variables that are related, namely age (p-value = 0.001) and length of service (p-value = 0.007), and there are 2 variables that are not related, namely BMI (p-value = 0.657) and working duration (p-value = 0.222).

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