THE EFFECT OF STRETCHING EXERCISE ON MUSCLE PAIN IN NURSING STUDENTS (A Study at the Faculty of Medicine and Health Sciences, Universitas Lambung Mangkurat)

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ABSTRACT

Background: Muscle pain is an uncomfortable sensation often caused by excessive muscle use, leading to muscle tension and reduced oxygen supply to the muscles. In students, pain can impact quality of life, disrupt concentration during lectures, cause sleep disturbances, and limit daily physical activities. Non-pharmacological nursing interventions, such as stretching exercises, can help reduce muscle pain by improving range of motion (ROM), reducing stiffness, and alleviating muscle discomfort. **Objective:** To determine the effect of stretching exercises on muscle pain in nursing students at Universitas Lambung Mangkurat. **Methods:** This quantitative study used a quasi-experimental design with a two-group pre-test and post-test control group design. The sample consisted of 34 respondents, divided into two groups: 17 in the intervention group who received stretching exercises and 17 in the control group who practised breathing relaxation techniques. Data analysis was conducted using the Wilcoxon and Mann-Whitney tests. **Results:** There was a significant reduction in muscle pain levels in the intervention group after stretching exercises (p-value 0.002) and in the control group after deep breathing relaxation techniques (p-value 0.034). **Discussion:** Stretching exercises are more effective in reducing muscle pain than breathing relaxation techniques, making them a viable alternative for managing muscle pain in students.

Keywords: stretching exercise, muscle pain, students

INTRODUCTION

Muscle pain is a discomfort in the muscles that many individuals frequently report. This pain often results in limitations in the sufferer's ability to perform daily activities (Andriyani et al., 2018). According to data from the Global Burden of Disease (GBD) in 2019, it is estimated that 1.71 billion people globally suffer from musculoskeletal problems. In Indonesia, data from the 2018 Basic Health Research Report (Riskesdas) indicated a prevalence of musculoskeletal problems at 7.3%. Specifically, in South Kalimantan, the prevalence was reported at 4.79% (Indonesian Ministry of Health, 2018).

Muscle pain is caused by excessive muscle use, leading to muscle tension, which results in a lack of oxygen supply to the muscles being used. Consequently, an anaerobic oxidation process occurs, creating lactic acid. Lactic acid buildup causes pain, stiffness, or soreness in the body (Dzulhy et al., 2022). Muscle pain manifests symptoms such as muscle spasms, limited range of motion (ROM), and reduced muscle strength (Ariastuti et al., 2018). In chronic cases, muscle pain may also cause additional symptoms such as swelling in the painful area, fever, chills, and fatigue (Indonesian Ministry of Health, 2022). Previous research revealed that prolonged sitting and poor sitting posture significantly contribute to lower back pain (Rachmat et al., 2019). This aligns with the habits of students who often sit for extended periods due to academic activities. Academic sessions typically last 1-4 hours and require students to spend most of their time sitting. This makes them prone to experiencing muscle pain (Nursiam et al., 2022).

Besides lectures, nursing students are also involved in various routines, such as skill labs, practical sessions, fieldwork, tutorials, and extracurricular activities like organizational

involvement. The demanding daily activities of nursing students can lead to physical fatigue and increase the risk of muscle pain due to excessive muscle use (Suha et al., 2022). This is supported by a study by Laeto et al. (2023), which states that 61.5% of students experience musculoskeletal pain due to high physical activity levels.

Among students, muscle pain can have negative impacts such as reduced quality of life, difficulty concentrating during lectures, sleep disturbances, limited daily activities, and increased medical expenses (Jahre et al., 2020). Furthermore, most nursing students will become nurses, providing healthcare services and meeting patients' basic needs (Nursiam et al., 2022). Therefore, proper management is necessary to address the muscle pain experienced by nursing students, ensuring it does not lead to long-term effects that could affect their performance in the future.

Stretching exercises are a non-invasive method that is easy to perform, requires no special equipment, can be done almost anywhere, and has minimal side effects. Additionally, stretching exercises are a specific type of workout that helps improve oxygen circulation to muscles in various body areas (Mulyani et al., 2023). These exercises provide benefits such as improving range of motion (ROM), reducing stiffness and muscle pain, maintaining joint mobility, increasing resistance to muscle injury or pain, preventing lower back pain, and enhancing personal appearance and self-image (Hoeger & Hoeger, 2015 in (Purwanti et al., 2021).

A preliminary study on 4 December 2023 with 12 nursing students from the Faculty of Medicine and Health Sciences at Lambung Mangkurat University found that all students reported experiencing muscle pain at varying levels. Of these, 33.3% experienced mild pain, 58.3% moderate pain, and 8.3% severe pain. Additionally, 11 out of 12 students attributed their muscle pain to prolonged sitting during lectures. This condition disrupted their activities and concentration during classes. Further screening on 18 December 2023 involving students from the 2021, 2022, and 2023 cohorts revealed that out of 233 students, 149 (63.96%) experienced primary muscle pain.

Based on these findings, the researcher is interested in studying the effect of stretching exercises on muscle pain among nursing students at the Faculty of Medicine and Health Sciences, Lambung Mangkurat University, Banjarbaru.

METHODS

This study employed a quantitative quasi-experimental design using a two-group pre-test and post-test with a control group design. The sampling technique used was probability sampling, specifically proportionate stratified sampling. The study sample consisted of 34 respondents divided into two groups: 17 respondents in the intervention group were given stretching exercises, and 17 in the control group were given breathing relaxation techniques. Data analysis was conducted using the Wilcoxon test and the Mann-Whitney test.

RESULTS AND DISCUSSION

Table 1. Respondent Characteristics

Characteristics	Intervention Group		Control Group	
	f	%	f	%
Gender				
Male	6	35,3	3	17,6
Female	11	64,7	14	82,4
Age				
19 years	6	35,3	6	35,3
20 years	4	23,5	6	35,3
21 years	6	35,3	5	29,4
22 years	1	5,9	0	0
Body Mass Index				
Underweight	5	29,4	2	11,8
Normal weight	7	41,2	10	58,8
Overweight	0	0	2	11,8
Obesity I	5	29,4	3	17,6
Obesity II	0	0	0	0
Muscle Pain				
No pain (0)	0	0	0	0
Mild pain (1-3)	6	35,3	2	11,8
Moderat pain (4-6)	6	35,3	12	70,6
Severe pain (7-10)	5	29,4	3	17,6

Based on Table 1, it can be observed that the distribution of respondents in the intervention and control groups shows that most respondents were female, totalling 25 individuals. Respondents in the intervention group comprised 6 males (35.3%) and 11 females (64.7%). Meanwhile, the control group consisted of 3 males (17.6%) and 14 females (82.4%).

For age characteristics, most respondents in both the intervention and control groups were 19 years old, totalling 12 individuals. Respondents in the intervention group included six individuals aged 19 years (35.3%), four individuals aged 20 years (23.5%), six individuals aged 21 years (35.3%), and one individual aged 22 years (5.9%). In the control group, respondents included six individuals aged 19 years (35.3%), six individuals aged 20 years (35.3%), and five individuals aged 21 years (29.4%).

Regarding body mass index (BMI) characteristics, most respondents in the intervention and control groups had normal weight, totalling 17 individuals. Respondents in the intervention group consisted of five underweight individuals (29.4%), seven individuals with normal weight (41.2%), and five individuals classified as Obesity I (29.4%). In the control group, respondents consisted of two underweight individuals (11.8%), ten individuals with normal weight (58.8%), two individuals who were overweight (17.6%), and five individuals classified as Obesity I (29.4%).

For the characteristics of muscle pain levels before the intervention (pre-test), respondents in the intervention group included six individuals with mild muscle pain (35.3%), six individuals with moderate muscle pain (35.3%), and five individuals with severe muscle pain (29.4%). Meanwhile, in the control group, respondents included two individuals with mild muscle pain (11.8%), twelve individuals with moderate muscle pain (70.6%), and three individuals with severe muscle pain (17.6%).

Data Analysis

Figure 1. Differences in Pre-Test and Post-Test Muscle Pain Levels in the Intervention Group
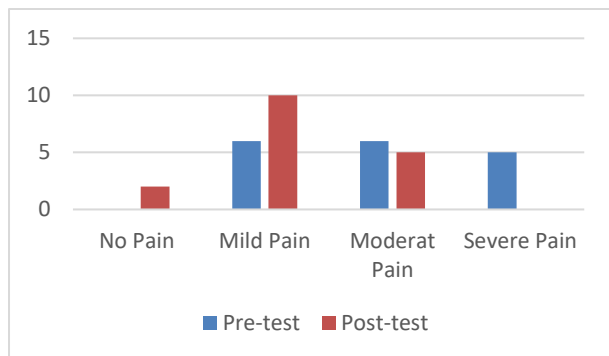
The picture above shows that the intervention group's pre-test and post-test levels of muscle pain have changed. There was an increase in the number of respondents who experienced no pain and mild pain. This shows that the level of muscle pain in respondents has decreased

Table 2. Differences in Pre-Test and Post-Test Muscle Pain Levels in the Intervention Group

Variable level of muscle pain	n	Mean±SD	p-value
Pre-test	17	2,94±0,827	0,002
Post-test		2,18±0,636	

The Wilcoxon Signed Rank Test calculation results show a significance value of $0.002 < 0.05$, which means there is a significant difference between the pre-test and post-test values for the level of muscle pain in the intervention group.

Figure 2. Differences in Pre-Test and Post-Test Muscle Pain Levels in the Control Group
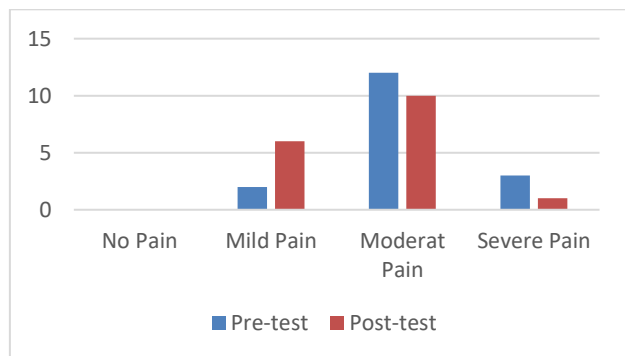
The picture above shows a decrease in muscle pain in respondents in the control group between the pre-test and post-test, but this change is insignificant.

Table 3. Differences in Pre-Test and Post-Test Muscle Pain Levels in the Control Group

Variable level of muscle pain	n	Mean±SD	p-value
Pre-test	17	3,06±0,556	0,034
Post-test		2,71±0,588	

The Wilcoxon Signed Rank Test calculation results show a significance value of $0.034 < 0.05$, which means there is a significant difference between the pre-test and post-test values for the level of muscle pain in the control

group.

Table 4. Difference in Pre-Test Muscle Pain
Levels Between the Intervention Group and the
Control Group

Variable level of muscle pain	n	Mean Rank	p-value
Pre-test (Intervention)	17	16,41	0,488
Pre-test (Control)	17	18,59	

The results of the Mann-Whitney Test show a significance value of $0.488 > 0.05$, indicating no significant difference in the pre-test muscle pain levels between the intervention group and the control group.

Table 5. Difference in Post-Test Muscle Pain
Levels Between the Intervention Group and the
Control Group

Variable level of muscle pain	n	Mean Rank	p-value
Post-test (Intervention)	17	14,00	0,023
Post-test (Control)	17	21,00	

The results of the Mann-Whitney Test show a significance value of $0.023 < 0.05$, indicating a significant difference in the post-test muscle pain levels between the intervention group and the control group.

DISCUSSION
Respondent Characteristics

Based on the study, it was found that in both the intervention and control groups, the majority of respondents were 19 years old, with 12 individuals. According to Agatha et al. (2022), age is one risk factor for muscle pain. As age increases, so does the risk of musculoskeletal disorders due to biological changes in muscle strength and endurance. This is supported by Oberne (1995) and Prawira et al. (2017), who stated that complaints of muscle pain typically occur in the working-age population, with the first complaints usually appearing around age 35 and complaints increasing as age progresses. However, even though all respondents were within the 19-22 years age range or young adults in this study, muscle pain still occurred. This is consistent with the opinion of Devi & Zamroni (2023), who stated that there is no significant relationship between age and the occurrence of back pain in medical students in Yogyakarta.

In terms of gender, it was found that in both the intervention and control groups, the majority of respondents were female, totalling 25 individuals. This study indicates that female students experience more muscle pain than male students. According to Goalbertus & Putri (2022), this may occur because the strength and tone of muscles in females are lower than in males. Additionally, hormonal changes in females also contribute to muscle pain complaints. These results align with research by Anjaya & Sasmita (2023), which found a significant relationship between gender and muscle pain, where females experienced more muscle pain compared to males at a ratio of 3:1. This finding is further supported by Ardi & Hidayah (2022), who stated that there is a relationship between gender and musculoskeletal complaints among students at the Faculty of Public Health at University X.

Regarding BMI, it was found that in both the intervention and control groups, most respondents had a normal body weight, totalling 17 individuals. According to Agatha et al. (2022), body weight is another contributing factor to muscle pain complaints. Excess body weight can affect the balance of the skeletal structure in supporting the body's weight, thereby increasing the risk of muscle complaints. However, the results obtained in this study indicate that most respondents had a normal BMI category. These findings suggest that BMI did not affect muscle pain in the respondents. This is consistent with research by Anjaya & Sasmita (2023), which showed no significant correlation between BMI and muscle pain cases in medical students in Jakarta. This finding is also supported by research by Costrila & Wahyuni (2022), which showed no significant relationship between BMI and musculoskeletal pain in medical students at Tarumanegara University.

Muscle Pain Levels Pre-Test and Post-Test in the Intervention Group

The data analysis using the Wilcoxon Signed Rank Test in the intervention group showed a p-value of $0.002 < 0.05$, indicating a significant difference between the intervention group's pre-test and post-test muscle pain levels. This allows the conclusion that there was a decrease in muscle pain levels after the implementation of stretching exercises. This is in line with the research conducted by (Parisma et al., 2024), who stated that the implementation of

stretching exercises effectively reduces muscle pain and improves comfort among workers. This is also supported by research by Maiani et al. (2022), which showed that stretching exercises are effective in reducing pain caused by musculoskeletal disorders in nurses at RSUD Bengkulu. According to Mardiyana et al. (2022), when performing stretching exercises with resistance for several seconds, the muscle fibre structures, particularly the sarcomere, are stretched due to reduced overlap, allowing the muscle fibres to elongate and thus reducing muscle pain.

Muscle Pain Levels Pre-Test and Post-Test in the Control Group

The data analysis using the Wilcoxon Signed Rank Test in the control group showed a p-value of 0.034 < 0.05, indicating a significant difference between the control group's pre-test and post-test muscle pain levels. This suggests that muscle pain decreased after implementing deep breathing relaxation techniques. This aligns with research by Saidi & Andrianti (2021), which stated that deep breathing relaxation techniques influence pain scales in patients with low back pain (LBP). This is also supported by research by Rahmawati & Hapsari (2017), which found a significant effect of deep breathing therapy in reducing pain scales in the elderly in Purwakarta. According to Arzeta et al. (2023), when performing deep breathing relaxation techniques, adrenaline levels in the blood decrease, inducing a sense of calm. This facilitates the regulation of breathing patterns, leading to increased oxygen levels in the blood and reduced blood pressure. As a result, the perception of pain decreases.

Analysis of Differences in Muscle Pain Levels Pre-Test and Post-Test Between the Intervention and Control Groups

Based on the results of the Mann-Whitney Test, which explains the differences in muscle pain levels between the intervention and control groups, a pre-test p-value of 0.488 > 0.05 was obtained, meaning there was no significant difference in the pre-test muscle pain levels between the intervention and control groups. Meanwhile, a post-test p-value of 0.023 < 0.05 was obtained, indicating a significant difference in the post-test muscle pain levels between the intervention and control groups.

Based on the research data from the pre-test, it was found that there was no difference in muscle pain levels between the intervention and control groups, which suggests that the age and BMI of the respondents did not directly affect the muscle pain levels. On the other hand, the post-test data showed a difference in muscle pain levels between the intervention and control groups, indicating that the interventions given to both groups impacted muscle pain. These findings show that both groups had an impact on reducing muscle pain through relaxation mechanisms. The intervention group, which received stretching exercises, was able to reduce muscle tension through muscle contraction relaxation mechanisms. Additionally, stretching exercises can increase oxygen supply to muscle cells, reducing pain sensation (Afia & Oktaria, 2018). Meanwhile, the control group, which received deep breathing relaxation techniques, stimulates the parasympathetic nervous system, increasing endorphin production, lowering heart rate, improving lung expansion, and relaxing muscles, ultimately reducing pain (Kusuma et al., 2024).

However, in this study, the effect of deep breathing relaxation techniques applied to the control group was smaller than the effect of stretching exercises given to the intervention group, which showed a higher effectiveness in reducing muscle pain. The researchers assume that deep breathing relaxation focuses more on stress management and general relaxation, while stretching exercises directly target the painful muscles through physical movement. This is supported by research by Asiah (2022), which stated that stretching exercises significantly reduce muscle pain, particularly because of their specific nature, which focuses on the painful areas. This study also showed that stretching exercises effectively reduce joint pain in the lower extremities of the elderly in Gowa. Combining both techniques could offer optimal benefits in reducing muscle pain. Further research is needed to explore this combination and identify factors influencing the effectiveness of each technique in various populations.

CONCLUSION

The study found that stretching and deep breathing relaxation techniques effectively reduced muscle pain in students. The group performing stretching exercises showed a more significant decrease in muscle pain with a p-value

of 0.002, compared to the deep breathing group, which had a p-value of 0.034. This indicates that stretching exercises more effectively alleviated muscle pain than deep breathing relaxation techniques. However, combining both techniques might provide even greater benefits in reducing muscle pain, and further research could explore the effectiveness of this combination.

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