

Original Article

The effect of McKenzie exercise on low back pain scale reduction in weavers in Fafinesu B village of North Central Timor

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ABSTRACT

Low back pain (LBP) is one of the frequent musculoskeletal disorders resulting from incorrect ergonomic positioning while working which is characterized by muscle pain and tension in the lower back. Exercise therapy on LBP is highly recommended to improve stability and correction of posture in the spine. This exercise therapy can be McKenzie exercise. This study aimed to determine the effect of McKenzie exercise on scale reduction of LBP in weavers in Fafinesu B Village, North Central Timor. The type of research used in this study is quasi-experiment. There was a significant difference in mean deviation in scale of LBP before and after McKenzie exercise in the intervention group compared to the control group ($P = 0.000$). There is a significant effect of McKenzie exercise on reducing the scale of LBP in weavers in Fafinesu B Village, North Central Timor.

Keywords: Low back pain, McKenzie exercise, Pain Scale

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INTRODUCTION

Human life is inseparable from work; however, the formal and informal workers have less attention for understanding and application of occupational safety and health so there are many occupational accidents and occupational diseases.^[1] Globally, there are 2.3 million work-related deaths each year caused by work with the majority of 2.0 million deaths caused by occupational diseases.^[2] The proportion of occupational diseases according to European occupational disease statistics is musculoskeletal disorders as much as 38.1%, nervous disorders 20.9%, respiratory disorders 14.3%, sensory organ diseases 12.8%, skin diseases 7.1%, cancer 5.1%, and infections 0.5%.^[3]

Musculoskeletal disorders that often occur as a result of the wrong ergonomic position when working are low back pain (LBP). According to the Global Burden of Disease in 2010, from the 291 diseases studied, LBP was ranked highest in

global as the causes of disability and was ranked sixth as the cause of death due to disability.^[4]

In 2017, the prevalence of LBP was estimated about 7.5% of the global population, or about 577 million people^[5,6] results of Basic Health Research (Riskesdas) in 2018, the prevalence of musculoskeletal diseases in Indonesia diagnosed by health workers was 11.9% and based on diagnosis or symptoms is 24.7%.^[7] The number of cases of the muscular system and connective tissue diseases in Kupang City, East Nusa Tenggara Province (NTT) in 2018 were 12,756 cases with a proportion of 7.3%.^[8]

LBP management consists of pharmacological and non-pharmacological management. One of the non-pharmacological management for LBP is muscle stretching. There are several muscle stretching methods that are effective in reducing the LBP scale including McKenzie exercise, William flexion exercise, and core stability exercise.^[9]

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Based on research conducted by Triyanita and Wardani (2022), it was found that McKenzie Exercise and William Flexion Exercise had a significant influence on reducing the LBP scale. However, from the average score, Mckenzie exercises had a greater influence on reducing the LBP scale.^[10] William flexion exercise and core stability exercise effectively increase flexibility and have a significant influence in scale reduction of LBP patients.^[11,12] In addition to effectively reducing the LBP scale, the movements on Mckenzie exercises are easier and simpler compared to other methods.

According to research conducted by Suputri *et al.* (2018) on “Effect of McKenzie Extension Exercise on LBP Scale Reduction” found a significant effect on reducing LBP levels with a mild scale of 15 respondents (37.5%) and a painless scale of 25 respondents (62.5%).^[13] LBP complaints are closely related to the static position of the body at the time of work over a relatively long period of time. One of the jobs done with a static sitting position over a long period of time is weaving.^[14]

Based on information from the Public Social Investment for Empowering the Women’s Movement assessment in 2015, it is stated that weaving is a livelihood for most women’s groups in East Nusa Tenggara Province (NTT). One of the famous cultural products of the people in NTT is Kasuri weave (ikat weave).^[15] The working position at each stage of weaving process for ikat weave is in an awkward posture. Weavers who worked with awkward postures, there were 77.3% who complaint about LBP.^[16] The awkward posture is bending, bowing, legs bending, and performing repetitive movements during the weaving process.^[17] Weavers who weaving the ikat weave in North Central Timor Regency are commonly found in the Insana region. One of the villages with a high number and activity of weaving is in Fafinesu Village B. Fafinesu B Village has a fairly dense population with heterogeneous community conditions and diverse economic levels.

Based on the description above, researchers are interested in conducting a study to see the effect of Mckenzie exercise on reducing the scale of LBP in weavers in Fafinesu B Village, North Central Timor.

MATERIALS AND METHODS

This research was conducted on August 13, 2022–September 18, 2022 in Fafinesu B Village, North Central Timor with 38 respondents. The type of research used is quasi-experiment with a non-equivalent control group design. The sampling technique used is purposive sampling.

In this study, researchers used the visual analog scale as an instrument to assess pain intensity. This research stage begins with filling out a questionnaire to find out the characteristics of potential respondents and asking for approval to become

the research respondents (informed consent) for prospective respondents who meet the inclusion criteria. Then, respondents were divided into two groups, namely, the intervention group and the control group consisting of 18 people of each group; then, pre-tests were carried out in both groups.

In the next stage, the intervention group was given an overview of Mckenzie exercises with the guidance of a physiotherapist. After getting an overview of Mckenzie exercises from a physiotherapist, the next Mckenzie exercise was performed by intervention group with researchers as training instructors. Mckenzie exercise interventions were performed twice a week for 4 weeks.

Ethical clearance was obtained from the Ethical Commission of the Faculty of Medicine and Veterinary Medicine, UNDANA, Kupang.

RESULTS

Characteristics of the study respondents included age, body mass index (BMI), working hours, and pain scale interpretation.

Based on Table 1, it showed that the most age range in the intervention group was 41–50 years which are nine people (50.0%), while the most age range in the control group was in the age range of 41–50 years and 51–60 years, as much as eight people (44.4%). BMI in the intervention group and control group was highest in the normal category, as much as 14 people (77.8%) in the intervention group and 17 people (94.4%) in the control group. Most respondents had 8 h of work in a day in both the intervention group and the control group in as much as 14 people (77.8%) and ten people (55.6%). The interpretation of the mild pain scale was highest in the post-test intervention group as much as 16 people (88.9%), while the moderate pain scale was the most in the pre-test intervention group as much as 12 people (66.7%).

In this study, a normality test was carried out first to determine the distribution of data which normal or abnormal distributed data. Normality test was carried out using the Shapiro–Wilk test because the respondents were <50 people. The results of the normality test using the Shapiro–Wilk test showed that the research data were distributed normally with $P > 0.05$.

Based on Table 2, the results obtained of data analysis is that the average of LBP scale in the pre-test of intervention group was 51.67 and the average of posttest of intervention group was 29.44 with $P = 0.000 (<0.05)$.

Different results were shown in the control group. The average value of the LBP scale in pre-test was 49.44 and in the post-test the average of the LBP scale was 48.89 with P -value of 0.331 (>0.05).

Table 1: Characteristics of respondents

Characteristic	Group Intervention		Control Group	
	Frequency <i>n</i> =18	Percentage	Frequency <i>n</i> =18	Percentage
Age (Years)				
20–30	0	0	0	0
31–40	1	5.6	2	11.1
41–50	9	50.0	8	44.4
51–60	8	44.4	8	44.4
Body Mass Index (Kg/m ²)				
<18.5 (Less)	4	22.2	1	5.6
18.5–22.9 (Normal)	14	77.8	17	94.4
Working Time (Hours)				
<8	3	16.7	6	33.3
8	14	77.8	10	55.6
>8	1	5.6	2	11.1
Pain Scale Interpretation				
Mild pain				
Pre-test	6	33.3	7	38.9
Post-test	16	88.9	7	38.9
Moderate Pain				
Pre-test	12	66.7	11	61.1
Post-test	2	11.1	11	61.1

Description: the number written in bold is the largest frequency

Table 2: Dependent *t*-test test or paired *t*-test sample

LBP scale results	Average		Average difference (Post-pre-test)		<i>P</i> -value	
	Intervention	Control	Intervention	Control	Intervention	Control
Pre-test	51.67	49.44	22.222	0.556	0.000*	0.331
Post-test	29.44	48.89				

Paired sample *t*-test **P*≤0.05

Table 3: Independent sample *t*-test

Variable	Group		<i>P</i> -value
	Intervention	Control	
	Average difference (Post-pre-test)	Average difference (Post-pre-test)	
Low back pain scale	22.222	0.556	0.000*

Independent sample *t*-test **P*≤0.05

Based on Table 3 below, the intervention group had a post-pretest mean difference of 22.222, while the control group was 0.556. The results of the analysis test *P*-value were 0.000 <0.05, where *p*-value was smaller than the degree of error, so *H*₀ was rejected and *H*₁ was accepted. Thus, it can be concluded that Mckenzie exercises had a significant influence on the scale reduction of the LBP in weavers in Fafinesu B Village, North Central Timor.

DISCUSSION

Characteristics of Respondents

Based on Table 1, the respondents were ≥35 years old. The most age range in the intervention group was 41–50 years and the most age range in the control group was 41–50 years and 51–60 years. These results are different from the studies conducted by Ones *et al.* (2021) regarding factors related to complaints of LBP in weavers, where most respondents with a risk age (>35 years) experienced LBP complaints.

BMI of the respondents in the most was in normal BMI category in both of intervention group and control group. This study showed that LBP complaints are not influenced by BMI but caused by other factors such as position when weaving for a long period of time and repeated. This research is supported by Harwanti *et al.* (2018), where the BMI, in the study, was the most in less and normal categories so there was no influence between BMI and the occurrence of LBP complaints.^[18]

The highest number of respondents had 8 h of work in a day in both of intervention group and control group. When sitting, the greatest pressure on the spine is in the lumbar or lower back area which withstands a load of 40–50% body weight so the pain will increase if sitting for a long time.^[19]

Intervention Groups

There was a significant difference in scale of LBP in the pre-test of intervention group and the post-test of intervention group. This can be happened due to the intervention group was given McKenzie exercises twice a week for 4 weeks with the duration of each exercise were 10 min, where Mckenzie exercises that are done regularly are able to reduce the scale of LBP.

This scale reduction of LBP is due to Mckenzie exercise, in which an exercise technique with extension movements that aim to strengthen and stretch the extensor and flexor muscles of the lumbo sacral joint so it can reduce pain by muscle relaxation. This study is in line with the research of Alhakami *et al.* (2019) which stated that Mckenzie exercise can minimize or eliminate local pain both acute and chronic and functional disability.^[20]

Control Group

There is no significant difference in the scale of LBP in the pretest of control group and in the post-test of control group. This is due to respondents in control group were not given interventions to treat LBP so there was no significant change in results at the time of post-test. The scale of LBP in the control group remained and actually increased.

The LBP condition in control group did not change significantly because there was no effort to reduce the complaints that existed, in this case, the control group did not exercise/stretch, so the oxygen supply to the muscles was reduced and it could cause muscle complaints. The level of muscle complaints also greatly influenced by the level of body fitness.^[21] Posture during the work process with a static sitting work attitude and combined with a bent position over a long period of time and repeated can cause muscle tension and fatigue. Long-lasting muscle contractions and repeated often trigger muscle fatigue associated with decreased strength, coordination, and the ability to maintain activity.^[22] The result of such work activities that are not interspersed with stretching muscles results LBP. Vibrations during weaving can cause increased muscle contractions which cause blood circulation to be uneventful, lactic acid build-up increases, and, eventually, pain arises.^[23-25]

Differences in the Mean Deviation between Pre-test and Post-test of Intervention Group and Control Group

The results of the independent t-test analysis showed *P*-value of 0.000 (<0.05), where *P*-value was smaller than the degree of error, so H_0 was rejected and H_1 was accepted; thus, it can be concluded that Mckenzie exercise had a significant influence

on reducing the scale of LBP in weavers in Fafinesu B Village, North Central Timor.

The results of this study are in line with the research conducted by Afrian *et al.* (2021) which showed that Mckenzie exercises can lower the scale of LBP. The degree of decrease in this pain scale can be attributed to the movements of back exercises that serve to dilate blood vessels. Increased blood circulation will be followed by increased cell oxygenation, leading to a decrease in lactic acid thus reducing pain.^[23]

The stretching technique in Mckenzie exercise can prevent tissue adhesions, maintain the elasticity and contractility of muscle tissue, and prevent the formation of inflammation in the joint cavity so that the scope of motion of the joint can be repaired and maintained.^[24] A light and slow movement stimulates the proprioceptor which is the activation of large diameter efferent fibers that can affect the nerve cells in the gelatinosa substantia thus inhibiting the transmission of pain by closing the spinal gate.^[25,26]

In the extension position that is maintained for a few seconds, a stretch will be obtained in the soft tissue of the anterior part, namely, the anterior ligament, so it will restore the position of the spine at the extension/lordosis position. This can help push the disk to the posterior, resulting in movements that push the nucleus into the ventral. In addition, due to the dynamic movement of extensions performed repeatedly on the lumbar will increase the fluid of the disc and corpus which will lower the viscosity of the nucleus pulposus to the anterior position and reduce irritation to the surrounding tissues with reduced emphasis on the spinal cord, thus lowering the intensity of LBP. This theory is supported by a dynamic model of the intervertebral disk which shows that when extension movement occurs in the lumbar, the nucleus pulposus in the intervertebral disk will be pushed toward the anterior so a tangential force will be obtained that pushes the nucleus into the ventral.^[27,30]

In Mckenzie exercises, there is relaxation of the low back which can provide a pain reduction effect.^[24] In a spasm muscle, there will be a relaxation by an intermittent and continuous stretching of the antagonist muscles. This weakening occurs due to stretching that will stimulate the muscle spindle so the reflex of the muscle relaxation occurs. The decrease in spasms is caused by the muscle spindle which is proprioceptive and has the ability to regulate impulses to the brain which is associated with the changes in muscle length and sudden and excessive changes in tone. If there is a sudden and excessive change in muscle tone, the muscle spindle will send impulses to the brain, so the muscle contracts as a form of defense and prevents injury. Therefore, in stretching, a temporary detention is carried out with the aim of adapting the muscle spindle to changes in muscle length, so the impulses from the brain to contract muscles are reduced. Minimal muscle contraction during

stretching will make it easier for muscle fibers to lengthen, so muscle spasms can be reduced which will have an impact on reducing the intensity of lower back pain. Intermittent stretching will improve microcirculation through a pumping action mechanism, thereby reducing irritation to the afferent nerves that cause reflexes to increase muscle tone.^[27]

Mckenzie exercises have scientific evidence and it can induce activation of the immune system and at the same time increase the concentration of the cytokine IL-4 that contributes to pain relief.^[28] A person who performs Mckenzie exercises stimulates β -endorphin so it will be captured by receptors in the hypothalamus and the limbic system that regulates emotions. Increased of β -endorphin has been shown to be closely related to decreased pain.^[29] Increased production of endorphin hormones in the blood will provide an inhibitory effect of the nerve endings of pain and prevent pain stimulation from entering the posterior cord of the spinal cord at the modulation stage, so the cerebral cortex does not receive pain signals that cause the intensity of pain to change or decrease.^[23,30]

CONCLUSION

There is a significant effect of Mckenzie exercise on reducing the scale of LBP in weavers in Fafinesu B Village, North Central Timor.

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CONFLICTS OF INTEREST

The authors declare that no conflicts of interest were found during this study.

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