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The Effect of William Flexion Exercise on Reducing Pain Intensity For Elderly with Low Back Pain

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Abstract

The elderly are a group of the population that has the potential to become vulnerable communities. In the elderly, the aging process can cause various physical problems. One of the issues that often arise in the elderly is low back pain (NPB). The purpose of this study is to evaluate the effect of the William Flexion Exercise on reducing the pain intensity for elderly with low back pain at Hisosu Binjai Resident Home, Indonesia. The research design is quasi-experimental with the pre and post-test control group approach in 2017. This study's sample consisted of 28 people in the intervention group and 28 people in the control group. The sampling technique utilized consecutive sampling. This study used The Pain Numerical Rating Scale to evaluate the level of pain intensity perceived by the patient. The data were analyzed by dependent and independent t-test with significance $\alpha < 0.05$. The dependent t-test found a significant difference in the low back pain before and after the intervention group intervention (p-value =0.000). In contrast, there is no significant difference in the control group (p-value = 0.081). The result of the independent t-test found that there are significant differences in the low back pain between the intervention group and the control group. This study concludes that William's flexion exercise provided benefits to most of the participants in this study. Thus, it may be an effective technique to reduce pain intensity and increase the range of motions.

Keywords: aging exercise therapy; low back pain; flexion exercise

INTRODUCTION

Low back pain (LBP), perhaps more accurately called lumbago or lumbosacral pain, occurs below the 12th rib and above the gluteal folds. LBP is one of the most common health problems all over the world (1,2). The lifetime prevalence of non-specific LPB may reach 80%, with the annual prevalence ranging between 25% and 60% in different ethnic groups (3). World Health Organization (WHO) reported that the world population aged over 60 years would increase from the current 841 million to two billion by 2050, turning chronic diseases and older people's welfare into new challenges for global public health (4-5).

Many risk factors caused low back pain, such as the worker who spent all their time by impressive duty, holder and lifted bulky goods, smoker, obesity, and activities. It was due to sit for a long time and influenced by the aging process (6). While most LBP causes among older adults are non-specific and self-limiting, seniors are prone to develop specific LBP pathologies and chronic LBP given their age-related physical and psychosocial changes (7). LBP often occurs in the elderly (8-9).

A variety of changes in the elderly occurred on a musculoskeletal system, including porous bones, enlargement of joints, shift a tendon, limited motion, depletion of intervertebral discuss and muscular weakness aging process. The bone reached its peak at the age of 35 years. After it happened, bone losses thorough gradually. In the elderly, the structure of collagen less able to absorb energy. Therefore, muscle does, and power is also reduced. Loss occurs the number of muscle fiber due to atrofimiofibril with the replacement of tissue fibrous that start to develop in the life in the fourth (10). The lumbar spine structures involved in the development of low back pain are intervertebral disk cartilages, intervertebral joints, tendons, and muscles. When the sensory receptors in these structures receive nociceptive stimulation, they trigger a pain reaction in the pain sensation system, including both at the peripheral and the central levels. Ligament and muscles that surround the lumbar spine. Strain in these structures results in back pain.

Inappropriate posture, irregular movement of the lumbar vertebrae, and reduced or imbalanced muscle strength enhance the nociceptive stimulation. Motion restriction due to pain leads to intervertebral joints' contracture and the atrophy of the other lumbar spine structures, resulting in a vicious circle of pain (11).

The results indicate a high prevalence of LBP among elderly individuals, ranging from 21.7 to 75%. Furthermore, the majority of LBP is high in developed countries such as Canada (75%) (5), the United States (67%) (12), Sweden (49%) (13), China (39.2%) (14) and Japan (32% (15). LBP occurs in 43% of both men and women, differing from the mean global prevalence, 31%. This finding was also confirmed in developing countries such as Brazil, where the majority was 33.6% to 68.3%. In other Brazilian studies, the small samples studied may have contributed to a high prevalence, and the samples may not have been representative of the study population (16).

There is still no epidemiology data about low back pain in Indonesia. Approximately 40% of Central Java society has over 65 years old whoever had low back pain. The Community Oriented Program for Control of Rheumatic Disease (COPCRD) of Indonesia showed that the prevalence of low back pain is about 18,2 % for men and 13,6 % for women. The incidence is based on patients visiting some hospitals in Indonesia, about between 3-17 % (17).

LBP recently was rated by the Global Burden of Disease Study as one of the seven health conditions that most affect the world's population. It is considered a debilitating health condition that affects people for the most significant number of years over a lifetime. LBP is a major cause of disability – affecting performance at work and general well-being. It is also associated with high treatment costs (18), (19).

Older adults are one of the communities that can become facilitate people so that need to create a physical and non-physical condition. More elderly who have low back pain handle it with resting, drink some traditional treatment or let it so. Older adults often get hurt on their low back if not taking muscle stretching as soon as possible by stretching so the joint will be small and resulting in pain. Reducing low back pain in patients is recommended with conservative therapy. By this exercise, therapy on low back cases had become a routine treatment for every practitioner in physiotherapy, but a nurse also can do the treatment. As role models in society, nurses have a significant role in obligating the pain through a non-pharmacology approach. Interventions that

include non-pharmacology approaches, such as giving good exercise (20).

Back exercise is one of the activities that give a great use. The back exercise routinely for a long time will actively progress the power of muscle, that called active stabilization. The progress of muscle power also affects the body's progress toward movement or loaded statistically and dynamically. There are many types of treatments for low back pain. These vary from conventional methods (physiotherapy, kinesiotherapy, massage) to modern techniques like ozone therapy. However, two protocols stand out due to their popularity, like the Williams and McKenzie protocols (21).

William Flexion Exercise is designed to reduce back pain by strengthening the muscles that reflect the lumbosacral spine, especially the abdominal and maximal gluteus muscles, and stretching the extensor muscle groups. The principle of exercise therapy using the William Flexion is to repair body posture, reduce lumbal hyperlordosis. It also decreases muscle spasms through relaxing effects, avoids stiff intervertebral joints, and checks the lousy posture (21-22). The back exercise was taken in a month (3 times in a week) showed a meaningful difference in the decrease of pain with the method of William Flexion (10).

Back exercise is an easy movement because it just has six moving and spends 15 – 20 minutes in every method. This method can be done three times a week (12). Besides easy to imitate, this exercise does not need sophisticated tools and special place, cheaper, and it can do by ourselves based on Standard Operating Procedure (SOP). Back exercise also gives influence toward the muscle bend progress, elastically bone and it can be reducing of low back pain.

Unlike other therapeutic methods, this method aims to make the patients as independent of the therapist as possible and thus capable of controlling their pain through postural care and the practice of specific exercises for their problem. It encourages patients to move the spine in a direction that is not harmful to their problem, thus avoiding movement restriction due to pain (12).

OBJECTIVE

The study aimed to evaluate William Flexion's effectiveness in reducing pain intensity for elderly with low back pain in Hisosu Binjai Resident Home.

METHOD

This research is a comparative analytic study using a quasi-experimental study with a pre and post-test control group approach. The samples of this study were recruited with consecutive sampling. Inclusion criteria include: never got same therapy, pain intensity before doing research was minimum to moderate, able to speak Indonesia, willing to followed research program entirely for four weeks, and low back pain did not accompany with neurological disturbance. Patients will be excluded if they have any contraindication to physical exercise include evidence of nerve root compromise (i.e., one or more moving, reflex, or sensation deficits). We also excluded the severe spinal pathology (e.g., fracture, tumor, inflammatory and infectious diseases), serious cardiovascular and metabolic diseases, previous back surgery. At the beginning and the end of the study, the participants were given the Numeric Pain Intensity Scale, which design to measure the pain of intensity scale.

This study used The Pain Numerical Rating Scale to evaluate the level of pain intensity perceived by the patient. The measurement for assessing pain using the Numeric Pain Intensity Scale (NPIS) has been translated into the Indonesian language. This NPIS was selected because this instrument was affordable and easy to administer in health services. The NPIS is a valid and reliable scale to measure pain intensity (24).

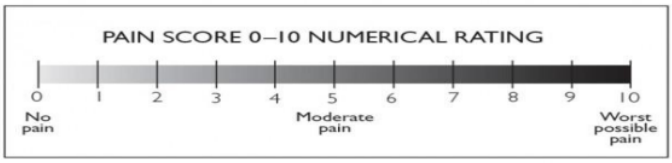

Figure. 1: Numeric Pain Intensity Scale

The Numeric Pain Intensity Scale is a scale that assesses the levels of pain intensity perceived by the patient using a 10-point scale (0 to 10), in which 0 represents "no pain," 5 represents "moderate pain," and 10 represents the "worst pain imaginable" (14,25).

Williams' Flexion Exercises (26,11) : Pelvic Tilt. Lie on your back with knees bent, feet flat on the floor. Flatten the small of your back against the floor without pushing down with the legs. Hold for 5 to 10 seconds. Single knee to chest. Lie on your back with knees bent and feet flat on the floor. Slowly pull your right knee toward your shoulder and hold 5 to 1seconds. Lower the knee and repeat with the other knee. Double knee to chest. Begin as in the previous exercise. After pulling the right knee to chest, pull the left knee to chest and hold both knees for 5 to 10 seconds. Slowly lower one leg at a time partial sit-up. Do the pelvic tilt and, while holding this position, slowly curl your head and shoulders off the floor. Hold briefly. Return slowly to the starting position. Hamstring stretch. Start in long sitting with toes directed toward the ceiling and knees fully extended. Slowly lower the trunk forward over the legs, keeping knees extended, arms outstretched over the legs and eyes focus ahead.

Hip Flexor stretch. Place one foot in front of the other with the left (front) knee flexed and the right (back) knee held rigidly straight. Flex forward through the trunk until the left knee contacts the axillary fold (armpit region). Repeat with right leg on and left leg back. Squat. Stand with both feet parallel, about shoulder's width apart. Attempting to maintain the trunk as perpendicular as possible to the floor, eyes focused ahead, and feet flat on the floor, the subject slowly lowers his body by flexing his knees. After four weeks, the post-treatment score will be taken by using a numeric pain intensity scale. Last, the score will be analyzed between pre and post-treatment and evaluate the spine flexion with pain intensity before and after exercise.

This study was conducted between February and June 2017 at Hisosu Binjai Resident Home, North Sumatera. The study was approved by the Research Ethics Committee of Faculty of Medicine of University of Muhammadiyah Sumatera Utara and certify that the study was performed following the ethical standards as laid down in the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards (certificate number 114/KEPK/FKUMSU/2017). All participants will be aware of this study's purpose, supported bya signed informed consent document. The patients will be interviewed by the researcher, who will determine eligibility. Eligible patients will be informed about the objectives of the study and asked to sign a consent form. A brief history of patients will be taken via physical examination was done The patient’s socio-demographic data and medical history will be recorded. The anonymity of the participants and the confidentiality of their information were assured throughout the research process. Data will be collected on a structured questionnaire enclosing questions targeting to assess the type, intensity, duration, and pattern of pain. These are the questions on relieving factors—occurrence of pain and the worse time of pain. The participants received 15 sessions of 15-20 minutes each (3 sessions per week for five weeks). Before and after the intervention, the participants will be instructed to select the average pain intensity based on the rating scale.

IBM SPSS Statistics was used for statistical analyses. To answer the question, descriptive and were generated for studied variables. Descriptive statistics (mean, SD, percentage) were used to examine the distribution of age, sex, and smoking lifestyle in the elderly at Hisosu Binjai Resident Home. Before we are doing the inferential statistic (Dependent and Independent sample

t-test), firstly, we examined the normality data by Shapiro Wilk Test. According to the result of the Shapiro Wilk test, data were normally distributed. The effectiveness of William Flexion in the elderly was analyzed using a Dependent and Independent sample t-test with significance $\alpha < 0.05$.

RESULT

Based on table 1, the mean age of the elderly in the control group was 67.85 (SD = 4.160), and the mean age of the elderly in the intervention group was 67.29 (SD = 4.730).

Table 1. The Characteristics in Elderly with Low Back Pain (n = 28)

Variable	Group	Mean	SD	Min-Max	95% CI
	Intervention	6729	4.730	61 -74	64.55– 70.02
	Control	67.85	4.160	60 -74	65.33 – 70.36

Based on the data in table 2, it can be seen that respondents in the control group had the same number of both males, i.e., 14 respondents (50%) and female, i.e., 14 respondents (50%). Meanwhile, most of the intervention group respondents were male, i.e.16 respondents (57.14%), and the rest were female, i.e., 12 respondents (42.86%). Based on the lifestyle of smoking, most of the respondents in the control group is no smoker, i.e., 15 respondents (53.57%), and the rest were smokers was 13 respondents (46.43%). Meanwhile, in the intervention group is smoker, i.e., 15 respondents (53.57%), and the rest were no smoker, i.e., 13 respondents (46.43%).

Table 2. The Characteristics in Elderly with Low Back Pain (n=28)

Variables	Category	Intervention Group		Control Group	
		N	%	N	%
	Male	16	57.14	14	50.00
	Female	12	42.86	14	50.00
LifeStyle of Smoking					
	Smoker	15	53.57	13	46.43
	No Smoker	13	46.43	15	53.57

Table 3 shows that based on the statistical analysis using the dependent sample t-test in the intervention group (p-value is 0.0000) and the control group (p-value is 0.081) at $\alpha = 0.05$.It may indicate a significantly different result of the low back pain before and after receiving the intervention (p-value =0.000). In contrast, there is no significant difference in the control group (p-value = 0.081). The result of the independent t-test found that there are significant differences in the low back pain between the intervention group and the control group. It may indicate a significantly different result between low back pain in control and those in the intervention group.

Table 3. The William Flexion Exercise in Elderly with Low Back Pain (n = 28)

Group	Pain Intensity	Mean	SD	SE	P-*value*
Intervention	Pretest	5.08	0.82	0.239	0.000
	Post-test	3.23	0.83	0.231	
Control	Pre test	4.79	0.76	0.128	0.081
	Post-test	4.26	0.64	0.116	

α = 0.05

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DISCUSSION

The Characteristics in Elderly with Low Back Pain

The findings of this study were consistent with previous studies. Among changes in lumbar spine structures, age-related degeneration of intervertebral disk cartilages and intervertebral joints are common causes of low back pain. Aging is a well-known risk factor of LBP as degenerative changes in the spine and disc. At the age of 60-year-old, muscle power dropping by 20%, and risk complaints muscle will increase. Increasing age will bellower the function of the human body system, including the musculoskeletal system. This will lead to a rise in musculoskeletal complaints, including low back pain (11). A Spanish study found that the prevalence rates of chronic LPB among females and males aged 65 years or older were 24,2% and 12,3% (27), respectively, while an Israeli study documented that the prevalence of chronic LBP in people aged years was as high as 58% (28).

The age-related changes in neuroplasticity may decrease pain tolerance in older adults. Compared to younger adults, older people tend to show more rapid temporal summation of noxious heat stimuli in their central nervous system. Similarly, older adults display a prolonged period of capsaicin-induced hyperalgesia. It may lead to persistent pain sensitization and sluggish resolution of neoplastic change. Notably, central pain processing can be further complicated by dementia-related neurodegeneration.

This study, inconsistent with Cho et al., explained that the lifetime prevalence of LBP was 61.3%, with women having a higher prevalence (29). The point and 6-month prevalence were also higher among women. Some studies have shown that males are at greater risk for low back pain, while other studies suggest that females are more likely to develop this type of pain. Women who have had two or more pregnancies have a higher risk of developing low back pain. Jimenez-Sanchez and cowokers (2017) estimated that women were two times more likely to develop chronic LBP than men. The higher prevalence of chronic pain in females may be attributed to complex bio-psychosocial. Further, women commonly have a higher number of concomitant chronic diseases (e.g., osteoporosis, osteopenia, and osteoarthritis), which are known to be riskfactors for developing chronic LBP and psychological distress in older adults (27), (30)

This study, consistent with Miranda et al. (2008), showed an association between smoking and LBP among over 50 years old. Smoking is related to a higher propensity for LBP in older people (27). Also, another study showed an association between smoking and decreased bone mineral density in women. Former smokers had a higher prevalence of low back pain than never smokers, but a lower prevalence of low back pain than current smokers. In cohort studies, both former (OR 1.32, 95% CI, 0.99-1.77) and current (OR 1.31, 95% CI, 1.11-1.55) smokers had an increased incidence of low back pain compared with never smokers. If you are a smoker, you are 2.7 times more likely to develop lower back pain than if you didn't smoke (31).

The researchers found that women who smoked complained more often of back pain than women who didn't smoke in both groups, not just the scoliosis group (32). It's not entirely understood how cigarette smoking affects the back. One theory is that nicotine causes vasoconstriction, or narrowing of the blood vessels, that provide nutrition to the discs' cells. If the nutrients can't reach the cells, this leads to malnutrition of the disc, and they can become damaged more easily. Malnourished tissues also can't heal themselves as quickly or as well as healthier, nourished cells. Nicotine is also known to thicken the walls of the blood vessels. This has the same effect of narrowing the blood vessels, slowing down blood flow. One of the by-products of cigarettes is carbon monoxide, an extremely poisonous gas. Carbon monoxide is also blamed for the increase in lower back pain. When you smoke, the carbon monoxide attaches itself to your hemoglobin, the part of your blood cells that carry oxygen to the tissues throughout your body. This burden on the

hemoglobin takes up space, keeping much-needed oxygen from reaching the discs in your back. Like vasoconstriction, this causes malnutrition to the cells (31-32).

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Results of observation based on research variables found p = 0.000 (p<0.05), which means there is a difference in the low back pain between the intervention and control groups. The study was consistent with (21) that there were significant effects of William's flexion exercise in inadequate back pain management. Pain intensity was significantly reduced. This finding supports the result of a study conducted by Sukmajaya, Alkaff, Oen, Sukmajaya (2020), showing that there was a significant ODI/ Oswestry Disability Index/ difference between pre-and-post-WFE implementation (31.05 Â± 17.40 vs. 14.10 Â± 11.78, p = 0.019) (33). There was no significant difference in ODI reduction between geriatric and non-geriatric participants (p = 0.24). It was consistent with Yundari & Mas (2018) explained that William's Flexion Exercise given to the woodcarvers significantly reduce the pain intensity (p-value = 0.000) (34).

About William Flexion, results are compatible with previous studies, which all of them known this protocol as an effective method. The William Flexion method involves repeated movements or sustained positions and has an educational component to minimize pain and disability and improve spinal mobility (23). The primary benefit is the opening of the intervertebral foramen, the stretching of ligamentous structures, and the distraction of the apophyseal joints. Previous studies demonstrated that active therapy could improve functional ability and reduce pain when it has both exercise and patient collaboration (35) explicitly.

The average decrease of low back pain caused flexion back muscle strengthens through William Flexion exercise to reduce the pain. It has related to muscle work. The more muscle strength, the more muscle is having a contraction, and on the contrary. The muscles do their function with the couple because when agonist muscle contraction, antagonist muscle in another way in relaxation. If this has not happened, the two muscles will drive each other blocking the movement and resulting in pain (21 22).

Flexion exercise can help reduce pain by reducing intradiscal pressure (21, 35-36). Someone who does the training, β-endorphin will be captured by receptors in the hypothalamus and the limbic system regulating emotions. Increased β-endorphin proved to be closely related to decreased pain, increased memory, improved libido, sexual ability, blood pressure, and respiration (37). This flexion exercise aims to reduce the body's pressure on the articular weight-bearing stress and stretch the muscles and fascia (increase the soft tissue extensibility) in the dorsolumbal region, useful for correcting the wrong posture. This flexion exercise also improves stability in the lumbar region by actively training the abdominal muscles, gluteus Maximus and hamstring (34).

CONCLUSION

William Flexion exercise in elderly with low-back pain was effective in reducing pain. The results of this study will contribute to better management of this population. Also, compared to the other back exercises, include Mc. Kenzie exercise of elderly is recommended in Hisosu Binjai Resident Home.

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