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The effect of the William Exercise on reducing lower back pain in patients at FPM Sunny Surakarta

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Abstract. *In everyday life, work is important for every individual to fulfill life's needs, every job definitely requires movement activities in the body. Lifting heavy weights and sitting for too long are examples of activities that humans often do. If this activity is done repeatedly, it will trigger health problems, one of which is lower back pain.*
Low back pain is a symptom caused by various abnormalities, whether known or unknown, low back pain is one of the many problems that are often encountered in society. As many as 84% of people will experience lower back pain problems. This pain is located between the thoracic area 12 to the gluteus (Cahya et al., 2016).

Keywords: *William Exercise, Lower back pain, symptoms.*

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INTRODUCTION

Background Behind

Based on the 2018 Basic Health Research Results, the prevalence of musculoskeletal diseases in Indonesia that have been diagnosed by health workers is 11.9% and based on diagnosis or symptoms is 24.7%. The number of sufferers of lower back pain is estimated to be between 7.6 to 37% (Ministry of Health, 2018). Results survey Global Burden of Disease Study year 2017 state that prevalence painful back lower on women are taller than men. The prevalence of sufferers of low back pain is increasing become 577.0 million or around 7.5% from all over population in world (Afshin et al., 2019).

One of the most common types of low back pain is myogenic low back pain. Myogenic low back pain is false One complaint the most that is as big as 77% compared to with other complaints (Qudus and Sumirat, 2019) Myogenic low back pain is pain Which relate with spasm (tension muscle) on muscle back, tendons And ligaments Which usually will arise if doing excessive daily activities (Maysaroh et al., 2021).

Myogenic low back pain can cause balance disorders resulting in stability in the abdominal and back muscles lower experience decline, painful This can arise Because there is

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potential for tissue damage, namely: fascia, blood vessels, dermis, tendons, cartilage, muscles, bones, ligaments, bursa and meniscus (Ismaningsih et al., 2019).

One of the health workers who can treat lower back pain is Physiotherapy. Based on the Regulation of the Minister of Health of the Republic of Indonesia (Permenkes, RI) No. 65 of 2015 states that physiotherapy is a health service that aims to develop, maintain and restore body movement and function. One of the 331 physiotherapy modalities in reducing pain in sufferers of myogenic lower back pain is William flexion exercise.

William flexion exercise is an exercise carried out to strengthen the flexor and extensor muscles in the lumbar spine, thereby causing pain subtraction painful. Exercise This Also increase stability in the lumbar region (reducing compression forces on the facet joints as well as stretching (stretching) flexor hip And extensor lumbar), strengthen abdominal and gut muscles and increases the mobility of the connective tissue of the posterior lumbosacral joint (Pramita et al., 2015).

According to Maysaroh et al., (2021), giving William flexion exercise can reduce pain in sufferers of myogenic low back pain at Mardi Waluyo Hospital, Blitar City. This is also supported by Sidarto et al., (2022) who stated that William flexion exercise can reduce pain in myogenic low back pain in PT head office employees. Nusantara Medika Utama.

REVIEW REFERENCES

Anatomy And Physiology

Changes in spinal structure that occur due to degenerative processes on elderly cause its flexibility decrease so that body posture becomes incorrect, namely the body tends to lean forward. *Vertebrae* that are not straight cause the COG (*center of gravity*) to change, then the abdominal muscles will pull the body forward and compensation occurs from *the back muscles* which work harder to maintain posture body. as a result *back muscles* experience spasm, causing pain in the lower back.

a. Tulang Belakang (*Columna Vertebrae*)

The spine consists of 33 ring-like bones called vertebrae (*columna vertebrae*). In general the spine has five regions, consisting of 7 cervical, 12 thoracic, 5 lumbar, 5 sacrum, and 4 *coccyx* (Parker, 2009) . The function of *the vertebral column* is to support the weight of the head and torso, protect *medulla spinalis* , possible out *spinal nerves* from *the vertebral canal* , where muscles attach, and allow movement of the head and trunk (Dachlan 2009).

b. Region Lumbar

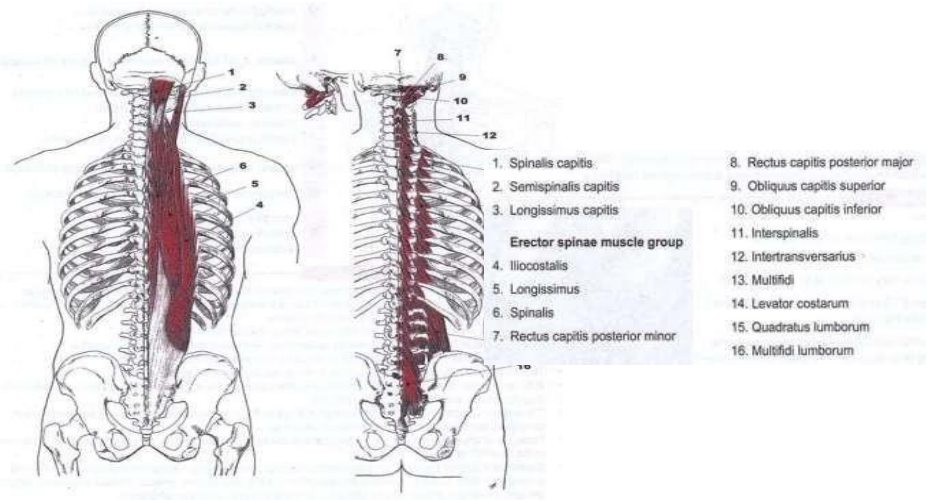
The lumbar region (L1-L5) is the strongest part and bears the heaviest load compared to the others. *The lumbar vertebrae* are located in the lower back region between the thoracic region and the sacrum. *The vertebrae* in this region are characterized by a large, strong *vertebral body and the absence of costal facets* . The L5 *vertebrae are the vertebrae* that have the greatest movement and bear the weight of the upper body (Levangie, 2005).

The vertebral body progressively enlarges according to its function as support body. *Arcus vertebral* located in posterior to *the vertebral body* and is part of *the vertebrae* formed by *the pedicle* (leg) and right and left *laminae* (flat plates). *The pedicle* is a short protrusion that connects *the vertebral arch* to *the vertebral body* . *The transverse processes* and *spinous processes* project from *the arch The vertebralis will be the attachments for the deep* muscles of the back and forms a lever that helps the muscles move *the vertebrae* (Dachlan 2009) .

The joints in the lumbar region , namely *the intervertebral discs* and the *zygapophysial joints (facet joints*). Ligaments that strengthen joints in *the vertebral column* of the lumbar region, namely the *anterior longitudinal ligament* , *posterior longitudinal ligament* , ligament *flavum* , *interspinous* ligament , *intertransverse ligament* , and *supraspinous ligament* (Chai 2005) .

Movements that occur in the lumbar region include flexion-extension, lateral flexion, and trunk rotation. The muscles that work in trunk flexion movements are *the rectus abdominis, external oblique, internal oblique, psoas major, psoas minor,* and *iliacus.*

The muscles that work as trunk extensors are *the quadratus lumborum, multifidus, semispinalis, erector spine, interspinales* and *rotatores.* And the lateral trunk flexor muscles, namely *quadratus lumborum, intertransversarii, external oblique, internal oblique, erector spinae,* And *multifidus.* Medium muscle rotator trunk namely *multifidus, rotatores, semispinalis, internal oblique,* and *external oblique* (Kenyon & Kenyon, 2009) .



Picture 2. 5 Muscles *Trunks*

Source: (Kenyon & Kenyon, 2009)

Painful

Pain is a feeling of discomfort felt by individuals both emotionally and sensory which is related to tissue damage or factor other (Asmadi 2008). Flavor painful different from One individual to individual based on each individual's pain threshold and pain tolerance.

Most somebody with disease or condition traumatic, Good which occurs in muscles, bones and joints usually causes pain. Bone pain can be described typically as a deep, dull, stabbing pain, while muscle pain is typically described as aching. Fracture pain is sharp and stabbing and can be relieved by immobilization. Sharp pain can also be caused by bone infections due to muscle spasms or pressure on sensory nerves (Helmi, 2012).

Painful Back Lower

Low back pain (NPB) is a pain syndrome that occurs in the lower back region which is the result of various causes. According to Hidayat et al. (2015), NPB No diagnosis disease, but musculoskeletal syndrome which is characterized by discomfort due to pain, tension and muscle stiffness in the lower back and surrounding areas.

NPB will increase when doing movements such as sitting, driving a car, and pain usually decreases when lying down or standing. Other things that can cause NPB include coughing, sneezing, lifting object Which heavy, And pushing when defecation due to increased intra-abdominal pressure resulting in pain (Helmi, 2012).

William Flexion Exercise

William flexion exercise is an exercise therapy for lower back pain sufferers developed by Dr. Paul William in 1937. According to Syafi'i (2012) the benefits of *William flexion exercise* is For reduce pressure burden body on facet joints (*articular weight bearing stress*), stretching muscles and fascia (increasing extensibility network soft) in area dorsolumbar, and to correct wrong body posture (Kusumawati & Wahyono 2015).

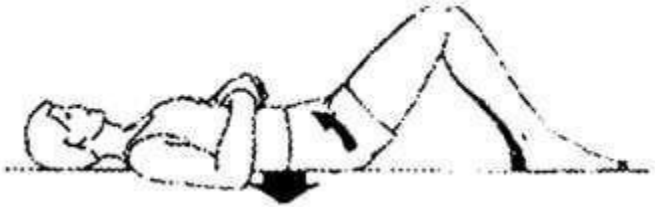
William flexion exercise can also increase lumbar stability Because in a way active practice muscles abdominal, gluteus maximus and hamstrings. In addition, *William flexion exercise* can increase intra-abdominal pressure which pushes the vertebral column backwards, thereby helping to reduce lumbar hyperlordosis and reduce pressure on the intervertebral discs. Theoretically, *William flexion exercise* can help reduce pain by method reduce style compression on joints facet, And stretches the hip flexors and lumbar extensors (Pramita 2014).

Contraindications to this *William flexion exercise* are segmental instability or hypermobility of the lumbar vertebral column, for example in circumstances spondylosis, spondylolisthesis And dysfunction joints facet (herniated disc and radicular pain). This exercise should be done carefully even avoided on patient with disturbance cardiovascular such as uncontrolled hypertension, history of acute myocardial infarction and stroke because this exercise can increase intra-abdominal pressure.

William flexion exercise consists of *pelvic tilting* , *single knee to chest* , *double knee to chest* , *partial sit up* , *hamstring stretch* , and *hip flexor stretch* (Abdullah 2015). According to Pramita (2014), overall *William flexion exercise* is carried out for 10 minutes with the following techniques and movements:

Pelvic Tilting

Sleep on your back with your knees bent, then press your back to the floor by contracting it muscles stomach, contraction muscle stomach maintained for 5 seconds. This exercise aims to strengthen the abdominal muscles and mobilize the lower lumbar region (Pramita 2014).



Picture 2. 6 *Pelvic Tilting*

Source: (Pramita 2014)

Single Knees to Chest

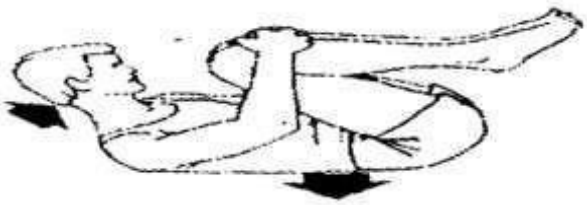
Sleep on your back with both knees bent, then slowly pull one knee up to press your chest while lifting your head. The movement is maintained for 5 seconds with 10 repetitions. Then slowly return to the original position and repeat the same movement for the knees left. This exercise aims to strengthen the abdominal muscles and to relax *the back muscles* unilaterally (Pramita 2014).

Picture 2. 7 *Single Knee to Chest*

Source: (Pramita 2014)

Double Knees to Chest

Sleeping position on your back with both knees bent, then pull both knees up to press against the chest while lifting the head, the movement is maintained throughout 5 seconds with 10 repetitions. This exercise aims to strengthen the abdominal muscles and relax *the back muscles* bilaterally (Pramita 2014).



Picture 2. 8 *Double Knee to Chest*

Source: (Pramita 2014)

Partials Sit Up

Do a *pelvic tilting movement* and at the same time raise it up head, neck, And shoulder from on mattress. Keep it up within 5 seconds and then return slowly to the original position. Then repeat the movement 10 times. This exercise aims to strengthen the abdominal muscles (Pramita 2014).

Picture 2. 9 *Partials Sit Up*

Source: (Pramita 2014)

Hamstrings Stretch

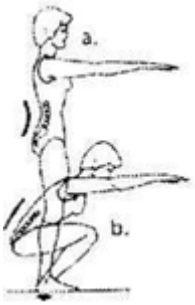
Sitting position with both legs straight forward, reach your toes without bending your legs. Maintain the movement for 5 seconds with 10 repetitions. This exercise aims to stretch shortened lower back muscles and hamstrings (Pramita 2014).

Picture 2. 10 *Hamstrings Stretch*

Source :http:// / www.osteoinfo.com.au/

c. Hip Flexor Stretch

Standing position with your back straight and both arms extended forward. Position both feet parallel. Then slowly squat down, with both arms still straight in front. Maintain the movement for 5 seconds with 10 repetitions. This exercise aims to strengthen the quadriceps muscles (Pramita 2014).



Picture 2. 11 *Hip Flexor Stretch*

Source: (Pramita 2014)

In research conducted by Blackburn and Portney (1981), during do *William's* workout *flexion* especially movement Pelvic tilting in the supine position means that EMG activity in the muscles of the lumbar and sacral areas decreases, which means muscle contractions also decrease. By reducing the contraction of the lumbar and sacral muscles, spasms will decrease and end in reduced complaints of pain. Whereas according to Hills (2001) that giving *William's* workout *Flexion* in mechanical lower back pain can stretch *the fascia* of the dorso lumbar area which ends in muscle relaxation and reduced muscle spasm so that pain can be reduced

(Abdullah 2015).

The second mechanism for reducing spasm due to *stretching* is because muscle proprioceptors or *muscle spindles* are activated when *stretching* . *Muscle spindles* are responsible for regulating signal to brain about changes in muscle length and sudden changes in tone and excessive. If there is a change sudden and excessive muscle tone, then *the muscle spindle* will send a signal to the brain to make the muscle contract as a form of defense and prevent injury. Therefore, when doing *stretching* done detention a number of moment with objective to provide adaptation of *the muscle spindle* to changes in muscle length we give it, so that the signal from the brain to muscle contraction is reduced. With minimal muscle contractions when *stretching* , it will be easier *for the muscle fibers* to lengthen and muscle spasms can be reduced (Costa & Vieira, 2008).

1. Algometer Digital

A digital algometer is a digital measuring instrument used for measure *pressure algometry* that is inspection Which efficient and effective For know mechanism physio-pathological Which involved in *muscle pain syndrome* (Farasyn & Meeusen 2005). *Pressure algometry* is used to determine the intensity of the pressure pain felt. This measurement stimulates *nocireceptor nerve endings* in *superficial tissue* , so that the pain *pressure threshold* (PPT) that can be felt by an individual can be known (Farasyn 2006).

Picture 2. 12 Algometer Digital Source: researchgate.net

The lumbar muscles in the back and hips are an important component of the human spine in activities. Several studies say that there is an increase in intramuscular pressure from the *erector spine muscles* in NPB patients. *Pressure algometry* on NPB in study This For know exists tenderness due to spasm in *the back muscles.*

The procedure carried out is that the subject lies in a *prone position* , Then given sign use fountain pen / whiteboard marker / *labels* in the anatomical location of *the erector spine muscles* , namely at a distance of 5 cm from *the spinous process* T6, T10, L1, L3 and 4 cm

from *the spinous process* L5. Then explain to the subject to notify the researcher if pain begins to be felt, then repeat the examination 2 times with a break of 5 minutes so as not to cause significant differences and then calculate the average pressure pain (Farasyn 2006).

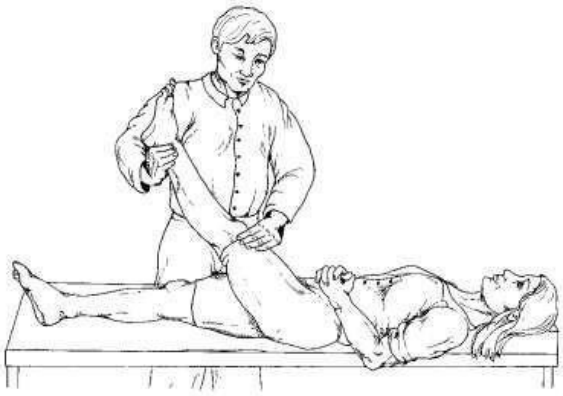
In book *Muscle Pain Syndromes and Fibromyalgia Pressure Algometry for Quantification of Diagnosis and Treatment Outcome* , PPT measurements have the following qualifications:

a) Borderline abnormality tenderness If worth not enough from 2 kg/cm²
b) Average threshold painful press range between 2 kg/cm²-5 kg/cm²
c) Limit PPT person normal above 5 kg/cm² (Fischer, 1998).

Test *Laseque*

NPB can be caused by various causes, one of which is referred pain due to *a herniated nucleus pulposus* (HNP), so that HNP can be said to be *a differential diagnosis* from NPB. HNP is also an Wrong One contraindications from *William flexion exercise* So, special checks are needed to avoid risks. The *Laseque* test is a test carried out to assess the presence of pain which is usually caused by HNP.

Laseque test shows there is tension in the spinal nerves in particular L5 or S1. As for in use test This, patient in a position *supine* is done flexion on knee moreover formerly, Then shouldered by therapist until 90 ^{o} And slowly done extension knee. The test is said to be positive if the patient feels pain in the legs, especially in the calves, the pain decreases when the knees are flexed. There is a modification to this test, namely, when lifting the leg with knee in circumstances extension (*straight legs raising*). Modification- modification test Laseque Which other all considered positive if it causes radicular pain (Helmi, 2012).



Picture 2. 13 Test Laseque
Source: (Buckup 2004)

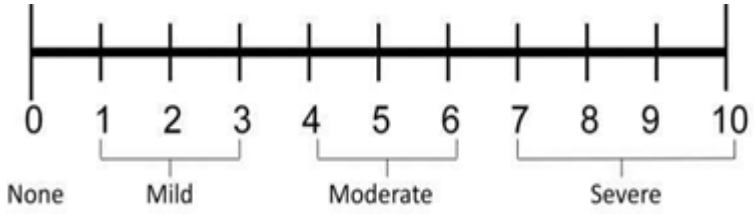
The smaller the angle created to cause pain, the more big possibility compression radix as the cause. The Laseque test is the best pre-operative sign for HNP, which was seen in 96.8% of 2157 patients who were operatively proven to have HNP (Helmi, 2012).

Numeric Rating Scale

For know threshold painful And interpret pain felt by clients/patients, physiotherapists or health workers must use a pain scale measurement tool. There are various kinds of pain scale measurement tools such as *the numerical rating scale* (NRS) , *verbal descriptor scale* (VDS), *visual analogue scale* (VAS), *pictorial pain scale* (eg Wong Baker *faces pain scale)* , and the McGill pain questionnaire (Herr & Garand 2001).

According to Herr & Garand (2001) although VDS, NRS, And FPS has validity Which can accepted when used on elderly, studies show that elderly people prefer VDS and NRS. However, use NRS is choice First And Which most Good for most elderly because ability.

For differentiate level flavor Sick more tall compared to other pain scale measurement tools, and is commonly used in clinical practice for other populations. NRS involves clients/patients to assess the pain they feel from 0 – 10, with a value of 0 meaning no pain, 1 – 3 mild pain, 4 – 6 moderate pain, and 7 – 10 meaning unbearable pain.



Picture 2. 14 *Numerical Rating Scales*

Source: (McCaffery & Beebe, 1989)

METHOD STUDY

This research is a pre-experimental type of research with a *One Group Pretest – Posttest approach.* This type of design only uses one group of subjects (*single group*) with measurements taken before and after the intervention. The aim of this research is to see the possibility of an influence that arises after being treated with a variable (Notoadmojo 2012). Researchers tested the level of pain before and after the *William Flexion Exercise intervention was given* to patients at FPM Sunny Surakarta.

Method Collection Data

Data collection was carried out by interviewing and giving questionnaires to patients at FPM Sunny Surakarta to find out whether respondents experienced NPB. After that, the researchers examined spasms in *the back muscles* using *pressure algometry , then continued with the Lasque* test to determine whether the respondent had HNP or not. Patients can become research respondents if the questionnaire results meet the inclusion criteria, examination results *pressure algometry* < 2-5 kg/cm ^{2} , And results test *laseque* negative. After that the respondents were gathered in the room and given informed *consent*, Then done test level painful before done The intervention uses NRS by means of employees pointing to numbers according to the pain they feel. After 8 exercises for 4 weeks, an evaluation was carried out in the last week to determine the level of pain afterward intervention. After all data collected Then data in analysis.

RESULTS AND DISCUSSION

Anyone can experience lower back pain, but it is common at an older age based on certain etiological factors (Harsono, 2000). This is due to physiological changes occurring in the elderly, namely in the musculoskeletal system, nervous system, system cardiovascular, system respiration, And system integument. Based on the results of data processing that has been carried out, the category of elderly according to WHO (2013) that is age 60-74 year is age the most who experienced NPB with a percentage of 73.3% and the average age of the sample is 71 year. Matter This supported by study conducted by (Muhith & Yasma 2014) that elderly people who experience NPB in orphanages Werdha Mojopahit Mojokerto on average is in the elderly category where 64% of the sample is aged 55-64 years and 36% of the sample is aged 65-74 years.

In this study, it was found that more samples who experienced NPB were female with a percentage of 66.7% compared to men with a percentage of 33.3%. This is confirmed by research conducted by Hoy et al. (2012) who said that the highest prevalence of people experiencing NPB were women with an age range of 40-80 years.

Based on the results of the *Paired Samples T-Test* in table 4.7, it shows that mark *p* is 0.001 Which own meaning that There is an effect of *William Flexion Exercise* on changes in the level of back pain lower on elderly in House Social Tresna Werdha Buddha East Bekasi Dharma in 2017. This is in accordance with Dr. Paul William (1937) who said that *William Flexion exercise* is one of them therapy exercise For sufferer NPB Which can increase Lumbar stability by training the abdominal muscles, gluteus maximus, and hamstrings. Besides That *William flexion exercise* can help reduces pain by reducing compression forces on the facet

joints, and stretching the hip flexors and lumbar extensors (Pramita 2014).

Apart from that, *William flexion exercise* can stretch *the fascia* in the dorso lumbar area, which then relaxes the muscles and reduces muscle spasms so that pain can be reduced (Abdullah 2015). The movements in *the William flexion exercise* are *stretching exercises* which are held for a few moments (in this study the movement was held for 5 seconds) which aims to provide adaptation to the *muscle spindle* to changes in muscle length given, so that the brain sends signal to muscle For reduce contraction. With minimal muscle contractions When *stretching*, it is easier for muscle *fibers to stretch* elongated And spasm muscle can reduce (Costa & Vieira, 2008). Matter This strengthened with study Which done by Muhith & Yasma (2014) entitled "The Effect of *William Flexion Exercise Therapy* on Painful Back Lower on Elderly in House Werdha Mojopahit Mojokerto" Which say that in period time 1 month given *william flexion exercise* during 8 time exercise experience enhancement significant, that is happen decline intensity painful back down with use tool measuring *numerical ratings scale* (NRS).

In another study conducted by Sa'adah (2013) entitled "The Effect of William Flexion Exercise (Stretching) on the Level of Lower Back Pain in the Elderly at Posyandu Elderly RW 2, Kedungkandang Village, Malang" stated that there was a decrease in the level of pain after being given *the William flexion exercise* . Do 3 exercises with a duration of 20-30 minutes.

This study uses the NRS as a tool to measure pain felt on elderly Which experience NPB. According to Herr & Garand (2001) NRS has validity that can be accepted by elderly people because of their abilities to differentiate the level of pain is higher than other pain scale measurement tools. In addition, NRS is more efficient and easier to create.

Limitations faced by researchers in carrying out research namely the lack of adequate facilities to carry out the intervention so the researcher had to visit each sample room. Cannot control respondents who took painkillers and those who took other therapies. The respondents obtained did not all experience pain at the same NRS level. Apart from that, there were several samples that were unable to follow the exercise movements.

CONCLUSION AND SUGGESTION

Conclusion

In this study entitled the effect of *William flexion exercise* on changes in the level of lower back pain in patients at FPM Sunny Surakarta, it can be concluded that:

1. The average NRS value before the *William Flexion Exercise intervention* was 4.93, which is included in the moderate pain category by standard deviation 1.38, And results

NRS Lowest that is 3 as well as NRS The highest is 7.

2. Average NRS value after the *William Flexion Exercise intervention* is 2.53 Which including category painful light with standard deviation 12.53, and the lowest NRS results namely 1 and the highest NRS namely 5.
3. From the results of hypothesis testing using *the Paired Samples T-Test*, value data was obtained Sig. (2 tailed) of 0.001 ($p < 0.05$) which means that there is an influence of *William flexion exercise* on changes in the level of lower back pain in patients at FPM Sunny Surakarta.

Suggestion

1. For future researchers with similar research, it is recommended to coordinate with Sunny to ensure that the facilities (room And mattress) in implementation *William flexion exercise* enough to use the entire sample.
2. This research can be used as additional knowledge and knowledge for physiotherapists and students so that it can be used as an exercise program and can be developed to reduce the level of lower back pain.
3. For Sunny, it is hoped that this research can be used as a reference for handling case painful back lower as well as expected to carry out *William flexion exercises* on a scheduled basis and guide patients with lower back pain to carry out the exercises continuously.

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