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# EFFECTIVENESS OF WILLIAM FLEXION EXERCISE TO REDUCE PAIN INTENSITY ON LOW BACK PAIN (LBP) OF WOODCARVERS IN BALI, INDONESIA

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### ABSTRACT

**Background:** Previous study shown 8 of 10 woodcarver in Bali experience low back pain (LBP), a clinical syndrome with major symptoms of pain or discomfort sense in the lower back area. A William's flexion exercise, an exercise program consisting of six kinds of movements, may decrease the pain by decreasing the lumbar lordosis (flexion). This study is to evaluate the effect of William's Flexion Exercise in reducing pain intensity of LBP to woodcarvers in Bali, Indonesia.

**Methods:** This study employed a quasi-experimental design with pretest-posttest approach and control group. Out of 42 woodcarvers in Mas Village, Gianyar, Bali, Indonesia, 20 sculptors were selected by a purposive sampling technique, and then were distributed equally to control and treatment group. Treatment group was given William's Flexion Exercise 2 times every week for 4 weeks. Pain intensity was measured by pain scale; low pain (scale 1-3), moderate (4-6), and high pain (7-10). Wilcoxon and Mann Whitney test were used for statistical analysis.

**Results:** The study found that William's Flexion Exercise given to the woodcarvers significantly reduce the pain intensity ( $p$  value = 0.000).

**Conclusions:** William's flexion exercise is recommended to be given to the woodcarver to reduce low back pain.

**Keywords:** Low Back Pain, Woodcarvers, Pain Intensity.

### INTRODUCTION

Pain can be felt in all parts of the body, and one of them is low back pain which is often called Low Back Pain (LBP). Low Back Pain (LBP) is a clinical syndrome with major symptoms of pain or discomfort in the lower back area. More than 80% of LBP is felt by all human beings in their life, LBP does not recognize the difference of sex, social status, or education level [1]. The World Health Organization (WHO) includes LBP as a priority for Bone and Joint Decade 2013-2016 and is proven by data from the European Agency for Safety and Health at Work (EASHW) showed that many workers complain of low back pain[2]. The results of a national study by the Study of Pain Association of Indonesian Neural Doctors (PERDOSI) in 2016 conducted in 14 cities in Indonesia found 4,456 (25% of total visits) of people with pain, of which 1598 people (35.86%) were sufferers headache and 819 people (18.37%) were low back pain sufferers.

Data in Bali shows 46.1% of people often complain of lower back pain, especially at the age of 30-40 years, because at this age is productive age which is lower back pain is felt closely related to work and physical activity [3]. Based on preliminary study in Gianyar regency through interviews

to woodcarvers, it obtained data that 8 of 10 people experienced LBP. According to resources, LBP is defined into 2 types there are mechanical and non-mechanical. Mechanical is caused by sprain and strain lumbar, generative process, HNP, and osteoporotic compression fracture. Non-mechanical is caused by daily activities, lifting heavy loads, sitting and standing too long in the wrong position [4]. In this case, the wood carvers have main cause of LBP most commonly is inappropriate posture while working or may be occur because of muscle tension that occurs over a period of 30 minutes to sit or bend position can lead to muscle breakdown. Sitting long leads to excessive load and can result in tissue damage to the lumbar causing complaints.

In general, the management of LBP that can be done to overcome is pharmacology, non pharmacology and surgery. Provision of pharmacological therapy is not recommended continuously because it can disrupt the function of other organs in the long term. Non-pharmacological therapy is an alternative to treating back pain. Physical exercise is one of nonpharmacology therapy and one of them is William's flexion exercise. William's flexion exercise is an exercise program consisting of six kinds of movements that are highlighted in the decrease of lumbar lordosis (lumbar flexion occurs). This model was first developed by Dr. Paul William's in 1937. William's flexion exercise has been the basis of low back pain management, based on diagnostic findings. In some cases, this exercise program is used when the cause of the disorder comes from the facet joint (capsule-ligament), muscle, and degeneration of the corpus and discus. Mr. William explained that the posterior position of pelvic tilting is essential to obtain the best result [5].

The impact if LBP is not addressed properly physiologically can cause muscle tension, spinal ligament strain, abnormal pressure in tissue, contraction of back muscles isometrically (against resistance), this may cause spinal nerve clamps or Herniated Nucleus Pulposus (HNP). This clamp may cause activity interruption and may cause paralysis. Economically, it can decrease the productivity of workers so it will decrease its income [6]. One of the jobs that can cause lower back pain is the woodcarver workers, where the area that has the art of wood craftsmen is Bali which is popular tourist destination with its craft art, especially woodcarving. The process of wood crafts consists of cutting wood, carving, smoothing, and finishing. The wooden craftsmen in Bali still carve traditionally, sitting on the floor with folding legs touching the chest and bending and repetitive hand movements in the wood carving. As a result of performing such work techniques can have ergonomic risks of abnormal posture, forced work posture with the back bending forward without stretching the muscles for a long time, so that workers may potentially suffer work-related injuries or work-related musculoskeletal disorders [7].

One area that is famous for its craft industry is Ubud District, Bali, Indonesia, with total number of woodcarvers is 681 people. There are 70 wood carvers in Banjar Tegalbingin, 42 people from 70 woodcarvers in Banjar Tegalbingin suffered low back pain [8]. About 10 woodcarvers got interview method found 7 wood carver workers have lower back pain, 3 of them experienced mild pain with a scale of 1-3 and 4 other wood carver workers experienced moderate pain with a scale of 4 -6.

## **METHODS AND MATERIALS**

The design used in this research is Quasy Experimental Pre Post with Control Group Design. Using the Wilcoxon test and Mann Witney test. The research was conducted in Mas Village, Gianyar, Bali, Indonesia. The sampling technique used is Non Probability Sampling with Purposive Sampling technique [9] The population was 42 people with the total sample members of each treatment group and the control group was taken 10 people as a sampels who had non-mechanical LBP, had not been consume analgetic, and have been works more than six months [10].

Treatment group was given William's Flexion Exercise with frequency 2 times every week for 4 weeks and pain intensity was measured by pain scale which classified into low pain (scale 1-3), moderate (4-6), and high pain (7-10) [11]. Protocol of study of William's flexion exercise is taken

from Source Athletic Training and Sport Medicine by Chad Starkey, Glen Johnson. Control group had ordered to do stretching which is they used to do.

## RESULTS

Table 1: Characteristics of Sample According To Age In Control And Treatment Group

Age	Control		Treatment	
	n	%	n	%
18-35 Young adult	2	20.0	3	30.0
36-55 Middle Aged	7	70.0	5	50.0
> 55 Old aged	1	10.0	2	20.0
Total	10	100.0	10	100.0

Based on table 1, the measurement of age characteristic of sampel in both group is mostly on middle-aged (36-55 years old). The data showed 70% for control group and 50% for treatment group. The results of intensity measurement of lower back pain pre-test and post-test in the control group on below:

Table 2: Intensity of Pain on Lower Back Pain (LBP) in Control Group

Pain	Pre-test Control Group		Post test Control Group	
	n	%	n	%
Low	1	10.0	1	10.0
Moderate	9	90.0	9	90.0
High	0	0	0	0
Total	10	100.0	10	100.0

Based on table 2, the measurement of pain intensity on pre-test was showed in control group most of respondent were in medium pain scale as much 9 people (90%) and respondents who have low pain as much 1 person (10%) and the data of post-test in control group showed moderate pain scale counted 9 people (90%) and respondent who experienced low pain as much as 1 person (10%). Based on Wilcoxon test results obtained  $p = 0.083$  ( $p > 0.05$ ) which means there is no difference of pain intensity in pre-test and posttest on control group. The results of measurement of low back pain intensity of pre-test and post-test in treatment group on below.

Table 3: Intensity of Pain on Lower Back Pain (LBP) in Treatment Group

Pain	Pre-test Treatment Group		Post-test Treatment Group	
	n	%	n	%
Low	2	20.0	9	90.0
Moderate	8	80.0	1	10.0
High	0	0	0	0
Total	10	100.0	10	100.0

Based on table 3. result of measurement of pain intensity of pre-test pain in treatment group, through on Wilcoxon test results obtained  $p = 0.000$  ( $p < 0.05$ ) which most respondent in medium pain scale counted 8 people, 1 respondent who experienced low pain and no one in high pain, and on the post-test data of treatment group after given William's Flexion Exercise obtained pain intensity on low pain as many as 9 people and only 1 respondent who feel moderate pain and no one feels high pain. It means there is a difference in pain intensity in pre-test and posttest in treatment group.

Table 4: Statistical of Intensity of Pain on Lower Back Pain (LBP) in Pre-Test

Central Tendency	Value	
	Pre test Treatment Group	Pre test Control Group
Mean	5.41	5.58
Median	5.46	5.62
Minimum	2	2
Maksimum	6	6
Std. Deviasi (SD)	1,73	1,48

Based on table 4, that shows on post test for the treatment group has mean 5.41, median 4.46, minimum value 2, maximum value 6 with SD 1.73 and mean 5.58 for the control group, median 4.62, minimum value 2, maximum value 6 with SD 1.48

Table 5: Statistical of Intensity of Pain on Lower Back Pain (LBP) in Post-Test

Central Tendency	Value	
	Post test Treatment Group	Post test Control Group
Mean	2,15	4,72
Median	2,21	4.70
Minimum	1	3
Maksimum	4	5
Std. Deviasi (SD)	1.94	1.98

Based on table 5, that shows on post test for the treatment group has mean 2.15, median 2.21, minimum value 1, maximum value 6 with SD 1.94 and mean 4.72 for the control group, median 4.70, minimum value 3, maximum value 5 with SD 1.98

#### *Differences Of Pain Intensity Of Lower Back Pain (LBP) On Control And Treatment Group*

The effect of William's Flexion Exercise can be seen through Mann Whitney's test that showed a significance value of  $p = 0.000$  ( $p < 0.05$ ) which means there was a significant difference of pain intensity on LBP between control group and treatment group which is given William's Flexion Exercise.

## **DISCUSSION**

### *Effectiveness Of William's Flexion Exercise In Reducing Pain Intensity On Lower Back Pain (LBP) Of Woodcarvers*

Results of observation based on research variables found  $p = 0.000$  ( $p < 0.05$ ) which means there is a difference in pain intensity in pre-test and posttest in treatment group. That means there are the differences value before and after the data of pain intensity of LBP of woodcarvers and have

significant difference between the pain intensity of LBP before William flexion exercised after William flexion exercises was given to the treatment group. One of the causes of lower back pain (LBP) such like like a static load on the back muscles will be able to cause muscles in the body tense and narrowed blood vessels. It can decrease the flow of blood which carrying oxygen and glucose to the rest of the body and consequently the person will be tired, his spine and muscles will be hurt. Narrowing of blood vessels can also lead to the release of substances that can stimulate pain receptors such as histamine, potassium ions, bradykinins, prostaglandins and P substances that will result in pain responses.

Results showed in treatment group got data that most respondent in medium pain scale counted 8 people, 1 respondent who experienced low pain and no one in high pain, and on the post-test data of treatment group after given William's Flexion Exercise obtained pain intensity on low pain as many as 9 people and only 1 respondent who feel moderate pain and no one feels high pain. That's mean there is an effect that pain intensity reducing after giving William's Flexion Exercise to that group. Pain is caused by the accumulation of residual results from metabolism that accumulated in the tissues. The accumulation of the residual metabolism is removed with enough back motion exercises to dilate the blood vessels. The fact that the blood circulation, the substances that are not useful for the body are also wasted, the pain will be reduced followed by reduced muscle spasme so it will relax the muscles, blood circulation and nutrition and activate the release of endorphin system in the blood [11]. This result also supported by other study which is found data analysis comparing visual analogue scale on both pre[5.06] and post test[3.56] showed  $p < 0.001$  highly significant with subjects. Comparing oswestry disability index questionnaire on both pre [28.80] and post[17.6] showed  $p < 0.001$  highly significant with subjects [12].

The high incidence of nonspecific low back pain of young and middle-aged people lies the fact that these people must maintain a high degree of activity of daily life at the time when the aging-related changes in the lumbar spine and tissues surrounding the lumbar spine start to occur, thus creating a gap between social needs and physical capabilities. Nonspecific low back pain must often be diagnosed based on exclusion, and it is important in particular to differentiate serious diseases such as spinal tumor and infectious spine diseases [13]. Endorphin is a neuropeptide produced by the body at the time of relaxation or calm. Endorphins are produced in the brain and spinal cord. Hormones can function as a natural sedative that the brain produces and produce a sense of comfort and increase levels of endorphins in the body to reduce pain. This training is proven to increase levels of  $\beta$ -endorphin which is one of endorphin hormone. Someone who does a lot of training will be higher also  $\beta$ -endorphin levels. A study from Gupta suggested that there was significant improvement in William's Exercise Treatment in reducing L.B.P in B.PT that showed 53.2 % in experimental group for L.B.P in B.PT students after 6-weeks of treatment [14].

Someone who does the training,  $\beta$ -endorphin will come out and be captured by receptors in the hypothalamus and the limbic system that regulates emotions. Increased  $\beta$ -endorphin proved to be closely related to decreased pain, increased memory, improved libido then, sexual ability, blood pressure and respiration [15]. Restoring strength, flexibility, and endurance of the back muscles in patients with LBP can be given a mechanical back exercise training program. Various methods of back exercise have been developed for the processing of lower back pain, including William's Flexion Exercise. It was first developed by Dr. Paul William's[16] The purpose of this flexion exercise is to reduce the pressure by the body burden on the articular weight-bearing stress and stretch the muscles and fascia (increase the soft tissue extensibility) in the dorsolumbar 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 [17]

In addition, this flexion exercise increases the intra-abdominal pressure that pushes the lumbar vertebral column backward, thereby helping to reduce lumbar hyperlordosis and reducing the pressure on the intervertebral disc. Theoretically, this flexion exercise can help reduce pain by

reducing the compression forces in the facet joints and flexing (flexing) the hip flexors and lumbar extensors. This flexion training method is suitable for improving or restoring lumbar mobility (flexibility) in the case of mechanical low back pain. A study by Bogduk confirmed age factor as one of a significant cause to LBP, it can be seen on this study result age characteristic of participant that showed most of respondents are in productive ages, young adult (18-35) and middle age (36-55) on both group, then in treatment group can be seen most respondents also in productive ages, which is 20% is in young adult (18-35) category, 50% in middle aged (36-55) category, and only 20% in old aged (>55) [18].

## CONCLUSION

There is a difference pain intensity on pre-test and post test in treatment group with value  $p = 0.000$  ( $p < 0.05$ ), there is no difference of pain intensity on pre-test and post test in control group with value  $p = 0.083$  ( $p > 0.05$ ), and there is a significant difference of pain intensity on LBP with value  $p = 0.000$  ( $p < 0.05$ ) between control group and treatment group which is given William's Flexion Exercise. It means, there is an effect of William's Flexion Exercise in reducing pain intensity on LBP of woodcarvers.

## SUGGESTION

It is advisable for the community especially woodcarvers and is expected to carry out the regular William's Flexion Exercise at home two times a week even without direct guidance by the researcher but can follow William flexion exercises leaflet or video. Health promotion can be conducted regularly by health institution (Puskesmas) provides education to the public about the benefits of William's Flexion Exercise and expected to provide training to his cadre about William Flexion Exercise.

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