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## THE EFFECTIVENESS OF THE LUMBOPELVIC STABILIZATION EXERCISE WITH RHYTHMIC STABILIZATION ON MICROWAVE DIATHERMY INTERVENTIONS TO REDUCE DISABILITY DUE TO MYOGENIC LOW BACK PAIN

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### ABSTRACT

Myogenic low back pain (LBP) is pain that caused by myogenic (muscle) factors as a source of pain. Myogenic LBP can cause disability in patients. The aim of this study was to compare the effectiveness of lumbopelvic stabilization exercise and microwave diathermy with rhythmic stabilization exercise and microwave diathermy in reducing disability due to myogenic LBP. The research method was experimental research with pre-test and post-test two control design. There were two groups randomly selected by the block permutation technique. The first group consisted of 16 samples who received lumbopelvic stabilization exercise and microwave diathermy treatment, while the second group consisted of 16 samples who received rhythmic stabilization and microwave diathermy treatment. Disability is measured by using the MODI (Modified Oswestry Disability Index) questionnaire. The study was conducted at a physiotherapy clinic in Denpasar. The results of the study after the Paired T-Test were carried out in each group with a p value <0.05, this indicated that there was a significant difference between the pre-test and post-test results in each group. The difference test between groups was carried out with the Independent T-Test, getting a p value <0.05, this indicates that there was a significant difference between the first group and the second group. The conclusion of this study is that lumbopelvic stabilization exercise and microwave diathermy reduce disability better than rhythmic stabilization and microwave diathermy due to myogenic lower back pain.

**Keywords:** *Disability; lumbopelvic stabilization exercise; myogenic lower back pain; rhythmic stabilization*

### INTRODUCTION

Myogenic LBP is pain caused by myogenic (muscle) factors as a source of pain or the occurrence of LBP starting from the costal border to the lumbar or lumbosacral region<sup>1</sup>. In myogenic LBP, muscle imbalance syndrome is generally found. The syndrome is termed lower-crossed syndrome (LCS). LCS is characterized by muscle stiffness and weakness<sup>2</sup>. It is estimated that 70-80% of the world's population have experienced myogenic LBP during their lifetime<sup>3</sup>. The annual prevalence varies from 15% -45% in high-risk jobs such as office employees, bank employees and drivers and it can cause disabilities and reduce productivity<sup>4</sup>.

Conventional physiotherapy interventions are more of a passive approach, such as electrotherapeutics modalities and manual therapy. The latest approach in this study is a combination of modality with active exercise methods and functional movement improvement with a stabilization and strengthening approach. This study compared the more effective stabilization exercise methods. The

modality used is microwave diathermy. The exercise therapy compared is lumbopelvic stabilization exercise with rhythmic stabilization.

Lumbopelvic Stabilization Exercise is an exercise method that activates and balances the work of m. transversus abdominis and m. lumbar multifidus where these two muscles are the main stabilizers in the lumbar. With the balance of muscle contraction and the work of the lumbar muscles, the disability in patients with myogenic LBP will decrease<sup>5</sup>. This is in accordance with the research of Widnyana et al. (2018), that lumbopelvic stabilization exercise is able to reduce disability in myogenic LBP patients with core muscle activation mechanisms. Rhythmic stabilization is a technique that uses isometric contractions, this technique does not allow any movement. The use of this technique is indicated in cases where there is pain when moving and reduced balance of agonist and antagonist muscle groups so as to reduce muscle spasm which will reduce disability<sup>6</sup>. This is in accordance with the research of Andrini et al. (2017), that rhythmic stabilization is able to reduce disability in myogenic LBP patients through a post isometric relaxation mechanism<sup>7</sup>

The combination of Rhythmic Stabilization Exercise with Microwave Diathermy works with a post isometric relaxation (PIR) mechanism that causes activation of an interneurone inhibitor. This interneuron will stop efferent motor neuron impulses and therefore prevent further contraction, decrease muscle tone, which results in relaxation and muscle fiber lengthening, this condition can reduce disability in myogenic LBP<sup>7</sup>. The combination of Lumbopelvic Stabilization Exercise with Microwave Diathermy is a new therapeutic concept that has a more positive impact in reducing disability in myogenic LBP because it works by improving the work of the dynamic muscular corset muscle. With the occurrence of coordinated and concurrent contraction (Co-Contraction) the tissue is not easily injured, abnormal lumbar muscle tension is reduced so that it will reduce disability<sup>8</sup>.

Based on the background problem above, the authors are interested in conducting research with the research problems whether Lumbopelvic Stabilization Exercise is more effective than Rhythmic Stabilization on Microwave Diathermy intervention to reducing disability due to myogenic LBP. The research purpose was to determine the comparative effectiveness of Lumbopelvic Stabilization Exercise and Microwave Diathermy compared to Rhythmic Stabilization and Microwave Diathermy in reducing disability due to myogenic LBP. It is hoped that this research can provide benefits for researchers, subjects, and for the Develop of the Indonesia.

## METHODS

### A. Research Design

The research design that has been carried out in this study was a experimental study design where the aim of this study is to compare the effectiveness of lumbopelvic stabilization exercise and microwave diathermy with rhythmic stabilization exercise and microwave diathermy in reducing disability due to myogenic LBP

### B. Place And Time

This research was conducted in I Made Niko Winaya's Physiotherapy Clinic on 32 myogenic LBP patients between July and September 2020.

### C. Population And Sample

The target population in this study were all patients indicated for myogenic LBP based on the assessment performed. The affordable population in this study were patients who were indicated for myogenic LBP at I Made Niko Winaya's Physiotherapy Clinic. Sampling was carried out based on the following inclusion criteria: (a) subjects with myogenic LBP based on the results of the physiotherapist's examination, (b) Age between 30-55 years, (c) Have a BMI between 18.5 - 27.0, (d) Moderate or severe disability score, (e) Not taking antiinflammatory drugs and any pain killer, (f) Myogenic LBP has gone through an acute period. For the exclusion criteria were as following: (a) Pregnant women, (b) Abnormality curve of the spine, (c) Presence of neurological disorder, (d) malignant tumor, (e) Patients with other disease that can interfere with result of the study (HNP, scoliosis, etc)

#### D. Sampling techniques

The sampling technique was consecutive sampling used in the sampling procedure in this study.

#### E. Research Procedure

The procedure of this research consisted of: the preparation stage and the implementation stage.

Preparation Phase: (a) Requesting permission from the relevant authorities for the sampling of myogenic LBP patients at the Physiotherapy Clinic I Made Niko Winaya; (b) The researcher determines the target population and selects respondents according to the criteria of inclusion, exclusion and physiotherapy assessment. (c) The researcher provides an explanation to the sample regarding the objectives, benefits and other important information in order to protect the sample and fulfill the research code of ethics; (d) Population filled in the informed consent form.

Implementation stage: (a) Once again in more detail explaining the procedural intervention to the respondent; (b) Disability score by filling out a questionnaire and the presence of myogenic LBP is checked by palpation method on the lower back area; (c) The control group received MWD intervention and rhythmic stabilization exercise while the treatment group received MWD intervention and lumbopelvic stabilization exercise. The intervention was given for 3 times in 1 week for 4 weeks. (d) Disability scores after 4 weeks intervention were carried out by filling out a questionnaire, (e) The data obtained processed in SPSS and discussed in the discussion of this study.

#### F. Data analysis

Data analysis using SPSS version 23 software. (1) Descriptive Statistics to analyze age, gender, and BMI, (2) Hypothesis testing using Paired Sample T-Test and Independent Sample T-Test.

##### 1. Normality test

Based on the results of the data normality test (Shapiro-wilk test) the explosive power of the leg muscles before and after the treatment group and control group training showed the results of the p value of both groups were above 0.05 or p was greater than ( $p < 0.05$ ), that the research data is normally distributed.

##### 2. Homogeneity test

Based on the results of the data homogeneity test using the Levenes Test, it shows that the p value of the two groups is above 0.05 or p is greater than ( $p < 0.05$ ) so that the research data is homogeneous.

##### 3. Hypothesis test

- a. Hypothesis 1 test used paired t-test to determine the mean difference in the effect of microwave diathermy and lumbopelvic stabilization exercise in group 1.
- b. Hypothesis 2 test used paired t test to determine the mean difference of the effect of microwave diathermy and rhythmic stabilization in group 2.
- c. Hypothesis 3 test used the independent t test to determine the difference result of group 1 compare with group 2, to test the significance different of the two groups.

## RESULT

Table 1 Sample characteristic

Characteristic	Group 1 (n=14)			Group 2 (n=14)		
	n	%	Average+SD	n	%	Average+SD
Age (Year)	16	-	45,94±7,20	16	-	46,69±7,28
Man	11	68,75	-	10	62,50	-
Women	5	31,25	-	6	37,50	-
BMI (Kg/m <sup>2</sup> )	16	-	25,27±1,34	16	-	24,78±1,16

The data on the characteristics of the research subjects obtained were age, sex and BMI. Based on the distribution of subjects according to age, it shows that in Group 1 the average age of the sample is 45.94 + 7.20. In Group 2 the average age of the sample was 46.69 + 7.28. Based on the percentage of gender, in both groups the percentage of the male sample was more than the female sample. The characteristics of the subjects according to BMI showed that the average BMI score in Group 1 was 25.27 + 1.34, while in Group 2 it was 24.78 + 1.16.

Table 2 Normality and Homogeneity Test

Disability Score	<i>Saphiro Wilk Test (p-value)</i>		<i>Levene Test (p-value)</i>
	Group 1	Group 2	
Pre	0,748	0,115	0,208
Post	0,069	0,100	0,061
Difference	0,584	0,568	0,357

Based on Table 2, the overall data has a p value > 0.05 and shows that all data in each group have a normal distribution. So that the hypothesis test used was parametric. Homogeneity test obtained p value > 0.05 (before and after intervention) which indicates homogeneous data.

Tabel 3 Paired Sample T-test

	Pre	Post	<i>p-value</i>
	<i>(Average+SD)</i>	<i>(Average+SD)</i>	
Group 1	31,12±5,60	17,56±4,46	0,000
Group 2	29,75±6,75	19,38±6,17	0,000

Table 3 shows the decrease in disability scores between before and after the intervention in Group 1 and Group 2 which were analyzed paired sample t-test with the same value, p = 0.000. These results suggest that in Group 1 the MWD intervention and lumbopelvic stabilization exercise significantly reduced disability in patients with myogenic LBP. In Group 2, the intervention of MWD and rhythmic stabilization significantly reduced disability in myogenic LBP patients.

Table 4 Independent Sample T-Test

	Pre	Post	<i>p-value</i>
	<i>(Average+SD)</i>	<i>(Average+SD)</i>	
Group 1	31,12±5,60	17,56±4,46	0,016
Group 2	29,75±6,75	19,38±6,17	

Based on the results of the independent samplet-test analysis, it shows that the disability scores after the intervention in Group 1 and Group 2 obtained p value < 0.05, which means that there was a significant difference between Group 1 and Group 2 in reducing disability in myogenic LBP patients. From the descriptive data, the percentage reduction in the MODI score in Group 1 was greater than the percentage reduction in the MODI score in Group 2. It was concluded that MWD and lumbopelvic stabilization exercise were better at reducing disabilities than MWD and rhythmic stabilization in myogenic LBP patients.

## DISCUSSION

Microwave Diathermy and Lumboelvic Stabilization Exercise Reduce Disability in Myogenic Lower Back Pain Patients

Lumbopelvic stabilization exercise has the ability to control the position and movement center of the body, because the main target of this exercise is the muscles that are located in the abdomen area, which are connected to the spine, pelvis and shoulders<sup>9</sup>. Lumbopelvic stabilization exercise is useful for maintaining static and dynamic stability of the trunk and preventing injury (to the back and lower extremities), especially in reducing disability. When the core muscles are weak or there is no balance (imbalance muscle), what happened was pain in the lower back area. With lumbopelvic stabilization exercise, the balance of the abdominal muscles and paravertebrae will form a better connected because there is coactivity of the inner muscles in the lower trunk so that can control during the movement of body weight shifting, movements of the extremities such as reaching and stepping<sup>10</sup>.

The results above are consistent with research conducted by Suarez et al., The research said that exercise therapy with lumbopelvic stabilization exercise concept, is an effective way not only to treat, but also to prevent LBP and lower limb injuries, especially in reducing disabilities that involve the core muscles, namely muscles. transversus abdominis, multifidus muscle, thoracic diaphragm muscle and pelvic floor muscles. These muscles all work in harmony to provide stabilization for the body (the neutral zone). By strengthening the muscles that support and improve spinal posture, it is effective to reducing the symptoms of LBP and reducing disability<sup>5</sup>. Jull and Richardson proved that patients with LBP are more beneficial if they are given repeated lumbopelvic stabilization exercises from the start to prevent instability of the trunk muscles compared to only given a general exercise program<sup>11</sup>.

#### Microwave Diathermy and Rhythmic Stabilization Reduce Disability in Myogenic Lower Back Pain Patients

In the rhythmic stabilization intervention, a post isometric relaxation (PIR) mechanism will occur. PIR refers to the reduction in agonist muscle tone after isometric contraction. This occurs due to the influence of a stretch receptor called the golgi tendon organ on the agonist muscle. In this technique, the force of muscle contraction against the same resistance triggers the organ's tendon golgi reaction. Afferent nerve impulses from the golgi tendon organ enter the dorsal spinal cord and cause activation of the interneuron inhibitor. These interneurons stop the efferent motor neuron impulses and therefore prevent further contraction, decrease muscle tone, which results in relaxation and muscle fiber lengthening<sup>12</sup>.

During the rhythmic stabilization intervention, afferent A-beta input from muscles and joints can reduce the activity of A-delta and C nociceptors that transmit impulses to the spinal cord, so that the perception of pain can be reduced according to the gate control theory. The strong stimulation of the A-beta nerve fibers to the t-cells will cause the substance gelatinosa to narrow so that the stimulation to the t-cells is weakened and the pain is reduced. With the reduction in pain, the Myogenic LBP patient will be able to do activities more optimal and reduce the disability previously experienced. Rhythmic stabilization can also increase muscle stability which will reduce the disability of myogenic LBP patients<sup>8</sup>.

#### Microwave Diathermy and Lumbopelvic Stabilization Exercise are More Effective to Reducing Disability than Microwave Diathermy and Rhythmic Stabilization in Myogenic Lower Back Pain Patients.

Intervention of lumbopelvic stabilization exercise is better than rhythmic stabilization in line with the theory that the principle of lumbopelvic stabilization exercise is to activate the work of the core muscle which is a deep muscle in which myogenic LBP patients experience weakness. The activation of the core muscles will increase the stability of the spine, because active core muscles will increase intra-abdominal pressure and this will form an abdominal brace which will increase the stability of the spine<sup>8</sup>. Increased activity and co-activity of antagonist trunk muscle can improve spinal control in LBP individuals thereby encouraging maintenance of the lumbopelvic position to remain stable<sup>10</sup>. The treatment of lumbopelvic stabilization exercise can provide increased muscle strength that is experiencing weakness as well as can reduce pain and reduce disability. Good stability is needed in patients with myogenic LBP rather than mobility, because the problem with myogenic LBP is reduced stability in the lower back<sup>5</sup>.

The implications of the research from the theoretical and practical aspects are additional knowledge and guidelines in providing effective exercise therapy for myogenic low back pain. The weakness of this research is there is no control over the activity, nutrition and psychology of the sample. Some of these

factors affect the disability of myogenic LBP patients. Researchers also did not conduct long-term follow-up of the research sample

### CONCLUSION

1. Microwave diathermy intervention and lumbopelvic stabilization exercise reduce disability in myogenic LBP patients.
2. Microwave diathermy intervention and rhythmic stabilization reduce disability in myogenic LBP patients.
3. The intervention of microwave diathermy and lumbopelvic stabilization exercise is more effective to reducing disability than microwave diathermy and rhythmic stabilization in myogenic LBP patients.

### CONFLICT OF INTEREST

The authors declare no conflict of interest

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