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## THE EFFECTIVENESS OF ADDING KINESIOTAPING TO MICROWAVE DIATHERMY AND MASSAGE INTERVENTION IN REDUCING DISABILITY IN PATIENTS WITH MYOGENIC LOW BACK PAIN

Made Widnyana<sup>1\*</sup>, I Made Niko Winaya<sup>1</sup>, I Putu Yudi Pramana Putra<sup>1</sup>, Anak Agung Gede Eka  
Septian Utama<sup>1</sup>, I Dewa Gede Alit Kamayoga<sup>1</sup>, Made Yoga Prabawa<sup>2</sup>

<sup>1</sup> Physiotherapy Department Medical Faculty Universitas Udayana, 80234, Denpasar, Indonesia

<sup>2</sup> Physical and Medical Rehabilitation Department, Faculty of Medicine, Universitas Udayana, Sanglah General  
Hospital, Denpasar, Bali

Email: widnyanamade@unud.ac.id

### ABSTRACT

Myogenic low back pain (myogenic LBP) is a back pain caused by muscles as a source of pain. Myogenic LBP can cause disability in patients. Kinesiotaping is one of the new methods used to reduce disability in myogenic LBP patients. The purpose of the study was to find out the effectiveness of adding kinesiotaping to microwave diathermy and massage interventions in lowering disability in myogenic LBP patients. The study used experimental methods with pre-test and post-test control group design. There are two randomly selected groups with block permutation techniques. The treatment group consisted of 16 samples receiving interventions in kinesiotaping, microwave diathermy and massage. The control group consisted of 16 samples received microwave diathermy and massage interventions. Disability is measured by MODI questionnaire (Modified Oswestry Disability Index). The research was conducted at a physiotherapy clinic in Denpasar. The results of the study after the Paired sample T-Test in each group with a value of  $p < 0.05$ , this showed that there was a significant difference between pre-test results and post-tests in each group. The inter-group different test was conducted with the Independent sample T-Test, obtaining a  $p < 0.05$ , indicating that there were significant differences between the treatment group and the control group. Microwave diathermy provides a deep heating effect so that it can increase metabolism, reduce pain, reduce spasms and increase muscle extensibility. Massage interventions are able to reduce pain through gate control theory mechanisms. Pressure on the surface of the skin also stimulates the release of endorphins that will inhibit pain impulses to the brain. Kinesiotaping has the benefits of reducing pain, joint fixation, smoothing lymph flow and muscle facilitation. With this mechanism, the addition of kinesiotaping further decreases disability in myogenic LBP patients.

**Keywords:** *Kinesiotaping; microwave diathermy; massage; disability; myogenic low back pain*

### 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>. It is estimated that 70-80% of the world's population have experienced myogenic LBP during their lifetime<sup>2</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>3</sup>. Disability is defined as a limitation or unable to move normally, in which there is impairment, activity limitation, participation restriction<sup>4</sup>.

Conventional physiotherapy management in myogenic LBP conditions is usually in the form of tool modalities, manual therapy and exercise therapy. In this study, researchers used kinesiotaping as the latest method in physiotherapy management on myogenic LBP. Kinesiotaping research for musculoskeletal conditions in Indonesia is still limited, so ongoing research is needed considering the use of kinesiotaping is very simple and practical. The study used microwave diathermy as a tool modality and massage as a

muscle tissue therapy manual. Research was conducted to prove that the addition of kinesiotaping to microwave diathermy and massage interventions further decreased disability in myogenic LBP patients.

Kinesiotaping is the latest method of taping to prevent or rehabilitate neuromuscular conditions. Kinesiotaping is made of one hundred percent cotton, fiber and latex-free, so it is very rare to cause allergies to the skin. Kinesiotaping material is resistant to water so it can be used for 3-5 days depending on the condition<sup>5</sup>. Some of the benefits of kinesiotaping include reducing pain, joint fixation, smoothing lymph flow and muscle inhibitions<sup>6</sup>. Raini, et al. (2018) stated that the combination of kinesiotaping and pregnant gymnastics significantly improved functional abilities in third trimester pregnant women who experienced myogenic lower back pain in the Verlos Kamer unit of Bali Royal Hospital Denpasar<sup>7</sup>. Nurcahya's research, et al. (2017) stated that the combination of kinesiotaping, infrared and massage significantly decreased functional pain in myogenic LBP patients. This research is important so that the effect of kinesiotaping on injury recovery, especially in cases of lower back pain is clearly known and not controversial or as a placebo only<sup>8</sup>.

Researchers hope that the results of this study can be used for the development of Indonesian physiotherapy in order to get the best and latest methods, so that it will have a positive impact on physiotherapists, stakeholders and patient recovery.

## METHODS

### a. Methodology

#### *Study design*

The study was conceived as a randomized pre and post-test controlled group design. Before patients were recruited, the study was approved by Medical Faculty of Udayana University/Sanglah Hospital Denpasar with ethical clearance number 2143 / UN14.2.2.VII.14 / LP / 2021. An explanation of the procedures and benefits of the study was conducted on all respondents before the study began. The study was conducted and reported in accordance with the CONSORT 2010 statement.

#### *Subjects recruitment*

Participants in this study were populations with myogenic low back pain in I Made Niko Winaya's physiotherapy clinic. Eligibility criteria in this study were age 40-50 years, BMI 18.5 – 27.0, pre-test MODI score 0 - 30, don't take any pills/medicine, past the acute period, cooperative and good communication. Subjects who have physical disabilities, spinal deformity, neurological disorder, cardiovascular disease, malignancy and other pathological condition that can affected result of the research were excluded from this study.

#### *Sampling technique*

In this study, sampling techniques were conducted by purposive sampling method. Blinding technique used is single blind, where the sample does not know whether the sample is a control group or treatment group. The participants were allocated to a treatment or a control group by using a randomized design with permutation block random. The number of blocks must be an even number, for example 4. The treatment group is given the symbol 1, while the control group is given the symbol 2. After entering the formula, six permutations are obtained: 1212, 1221, 1122, 2121, 2112 and 2211. Then one permutation is chosen at random, selected 1212. So in practice, the first patient as a sample of the treatment group, the second patient as a sample of the control group. And so on, it was repeated from the beginning until it got 32 patients.

### b. Material and procedure

#### *Material*

Myogenic low back pain were assessed by palpation test and muscle stretch test. Weight measurements were carried out using digital weighing scale with a decimal number one decimal point in kilograms.

Height measurement were carried out using stature meter. Disability score carried out using MODI questionnaire. The disability test result divided into three categories, light, moderate and severe's disability.

#### *Procedures*

In the installation of kinesiotaping, the physiotherapist provides an explanation of the procedure, the purpose / benefits and risks of kinesiotaping installation. The lower back area that will be fitted with KT is cleaned first with tissue / towel to dry. The patient is in a stretched position or semiflection trunk position. The method of installing kinesiotaping from insertion to origo with a pull of 25-50%. Kinesiotaping is used for a maximum of 3 days, and is replaced afterwards. In massage intervention, the physiotherapist describes the procedure, the purpose / benefits and risks of massage. The patient is then positioned on his stomach. If the patient is unable to lie on his stomach, it can be done with a left tilt and right tilt. Massage is done with baby oil media for 15 minutes on the regio lower back. In MWD intervention, physiotherapists explain about the procedures, objectives / benefits and risks of using MWD. The patient is then positioned face down, if the patient is unable to face down then it can be positioned on the left or right tilt. Free the area to be given MWD modalities from clothing, underwear, or belts. MWD is applied for 10-15 minutes on the lower back area of patients with a distance of 7 - 10 cm. Intervention in the sample was given with a frequency of 3 times in 1 week for 4 weeks. The total sample in both groups received 12 interventions.

#### c. Assessment

Disability score was measured twice, first time treatment (pretest) and the last time treatment, after (posttest). Disability scores were measured by MODI questionnaires. This questionnaire is designed to provide information to physiotherapists how myogenic LBP affects the ability of samples in daily activities. The sample answers each question by marking a box describing your condition today. There are five classifications of disabilities, namely: disability at least (0%-20%), moderate disability (21%-40%), severe disability (41%-60%), very severe disability (61%-80%) and unable to move (81%-100%).

#### d. Data analysis

Data analysis using SPSS version 16.0 software. (1) Descriptive Statistics to analyze age, gender and BMI, (2) Hypothesis testing using Paired Sample T-Test and Independent Sample T-Test.

##### *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.

##### *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.

##### *Hyphotesis test*

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

**RESULTS**

Table 1 shows the characteristics data of the study subjects consisting of age, gender and BMI.

Table 1. Respondents characteristics based on age, gender and BMI

Subject Characteristics	Group 1 (n=16)			Group 2 (n=16)		
	n	%	Average±SD	n	%	Average±SD
Age (year)	16	-	44.75±3.59	16	-	45.06±3.47
Men	10	62.50	-	10	62.50	-
Women	6	37.50	-	6	37.50	-
BMI (kg/m <sup>2</sup> )	16	-	23.81±1.26	16	-	23.36±1.10

Table 1 shows the characteristic data of the study subjects consisting of age, gender and BMI. Based on the distribution of subjects by age showed in group 1 the average age of the sample was 44.75 +3.59. In group 2 the average sample life was 45.06+3.47. Characteristics of subjects by gender in both groups showed that the most subjects in both groups were 10 men (62.50%) compared to 6 female subjects (37.50%). The characteristics of the subject according to IMT indicate that the average value of BMI in group 1 is 23.81+1.26, while in group 2 it is 23.36+1.10.

Table 2. Hypothesis Test with Paired Sample T-Test

Group	Pre (Average±SD)	Post (Average±SD)	p-value
Treatment	20.81±5.51	7.25±4.45	0.000
Control	19.75±6.74	10.31±4.96	0.000

Table 2 shows a decrease in disability scores between before and after intervention in the treatment group and control group. Changes in disability scores were analyzed with a paired sample t-test with the same value of p=0.000. The results stated that either the treatment group or the control group were equally significant in lowering disability in myogenic LBP.

Table 3. Hypothesis Test with Independent Sample T-Test

Group	Pre (Average±SD)	Post (Average±SD)	p-value
Treatment	20.81±5.51	7.25±4.45	0.012
Control	19.75±6.74	10.31±4.96	

Based on the results of the independent sample t-test analysis, showed that disability scores after intervention in the treatment group and control group obtained a p<0.05 score which means there is a significant difference between the treatment group and the control group in lowering disability in myogenic LBP patients. From descriptive data, the percentage decrease in MODI scores in the treatment group was greater than the percentage decrease in MODI scores in the control group. It can be concluded that the addition of kinesiotaping to microwave diathermy and massage interventions further decreases disability in myogenic LBP patients.

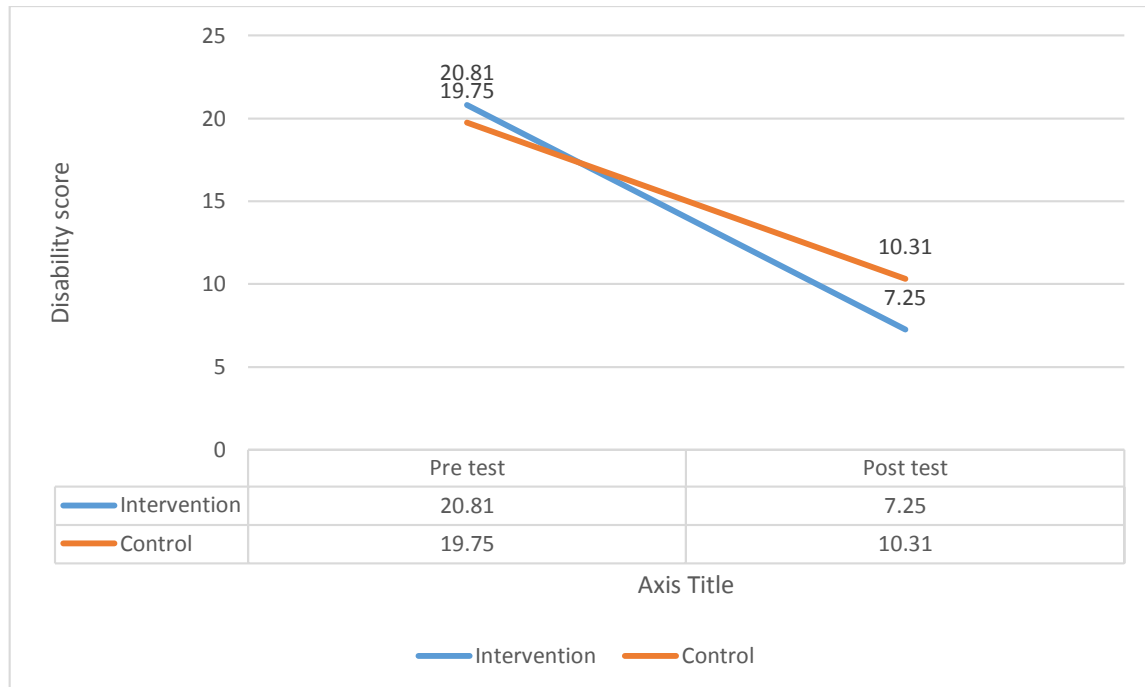


Figure 1. Disability score before and after intervention

## DISCUSSION

Based on the distribution of subjects by age showed in group 1 the average age of the sample was  $44.75 \pm 3.59$ . In group 2 the average sample life was  $45.06 \pm 3.47$ . Pramita states that myogenic LBP is experienced as an adult, i.e. at the age of 30 years to 55 years<sup>9</sup>. Characteristics of subjects by gender in both groups showed that the most subjects in both groups were 10 men (62.50%) compared to 6 female subjects (37.50%). Physiologically women's muscular abilities are not as good as men's and heavier work is predominantly done by men. This is what makes men more often experience myogenic LBP<sup>10</sup>. The characteristics of the subject according to IMT indicate that the average value of BMI in group 1 is  $23.81 \pm 1.26$ , while in group 2 it is  $23.36 \pm 1.10$ . The study is in line with a meta-analysis conducted by Shiri et al., which states that BMI is statistically related to myogenic LBP. Individuals who have overweight BMI and obesity are more at risk of developing myogenic LBP<sup>11</sup>.

Based on the paired sample t-test in the control group, the value of  $p = 0.000$  ( $p < 0.05$ ) with these results can be concluded that microwave diathermy and massage significantly reduce disability in myogenic LBP patients. The results of this study are in accordance with the research of Juniantari et al (2018) and Winaya et al (2019). Juniantari et al (2018) examined microwave diathermy intervention and slow stroke back massage more effectively compared to microwave diathermy and william flexion exercise in improving functional ability in cases of myogenic low back pain. The combination of MWD and massage significantly improved functional capabilities in the myogenic LBP sample<sup>12</sup>. Winaya et al (2019) examined the difference in the effectiveness of microwave diathermy intervention and deep tissue massage more effectively than microwave diathermy and Mckenzie neck exercise for posture correction in patients with forward head posture. The combination of MWD and massage significantly corrects the forward head posture with mechanisms to reduce pain, reduce spasms and restore normal alignment. Conditions of pain and spasm in patients forward head posture also occur in patients LBP myogenic<sup>13</sup>.

The effect of using MWD is maximizing deep heating so as to produce increased heat in body tissues, increase blood flow, increase filtration and diffusion of different membranes, increase tissue metabolic rate,

reduce joint stiffness, cause a relaxing effect on muscles, and help recovery after a muscle injury<sup>14</sup>. Massage is a manipulation of soft tissue structures that can calm and reduce psychological stress by increasing endorphins, enkefaline and dinorfin while lowering stress levels of hormones such as cortisol, norepiphirin and dopamine. Physiologically, massage has been shown to lower heart rate, increase blood pressure, improve blood and lymph circulation, reduce muscle tension, increase joint range of motion and reduce pain<sup>15</sup>.

Based on the paired sample t-test in the treatment group, the value  $p = 0.000$  ( $p < 0.05$ ). With these results it can be concluded that the addition of kinesiotaping to microwave diathermy and massage interventions significantly decreases disability in myogenic LBP patients. These results are in accordance with the research of Raini, et al. (2018) and Nurcahya, et al. (2017). Raini, et al. (2018) examined the difference between giving pregnant gymnastics and massage with pregnant gymnastics and kinesiotaping to increased functional activity in third trimester pregnant women who experienced myogenic lower back pain in the Verlos Kamer unit of Bali Royal Hospital Denpasar. The combination of pregnant gymnastics and kinesiotaping was significantly able to improve functional abilities in samples experiencing myogenic LBP<sup>7</sup>. Nurcahya, et al. (2017) examined the difference between the combination of William flexion exercise with the installation of kinesiotaping on infrared intervention and massage against the reduction of functional pain in gycogenic gycosing workers with miogenic LBP in Pejaten Village of Tabanan Kediri Subdistrict. The combination of kinesiotaping, infrared and massage significantly decreased functional pain in samples experiencing myogenic LBP<sup>8</sup>.

Kinesiotaping is the latest method of taping to prevent or rehabilitate neuromuscular conditions. Kinesiotaping is made of one hundred percent cotton, fiber and latex-free, so it is very rare to cause allergies to the skin. Kinesiotaping material is resistant to water so it can be used for 3-5 days depending on the condition. Some of the benefits of kinesiotaping include reducing pain, joint fixation, smoothing lymph flow and muscle inhibition. In the condition of myogenic LBP patients, patients have disabilities due to structural problems, functions, activities and social participation. In accordance with the contents of the MODI instrument, disability in patients consists of 10 conditions, namely: intensity of pain, self-care, lifting, walking, sitting, standing, sleeping, social life, traveling and work / household. In myogenic LBP patients, kinesiotaping works on functional problems, namely muscle pain and spasm. With the improvement of function by kinesiotaping, other disability conditions in the form of limited activities and social participation can decrease<sup>6</sup>.

Based on the independent sample t-test, the value  $p = 0.012$  ( $p < 0.05$ ), which means there is a significant difference between the treatment group and the control group. From descriptive data, the percentage of disability reduction after the treatment group intervention was greater than that of the control group. So it can be concluded that the addition of kinesiotaping in microwave diathermy and massage interventions further decreases disability in myogenic LBP patients. These results are in line with Elkholy's (2017) study which examined the effectiveness of kinesiotaping as an additional intervention in the management of conventional physiotherapy for acute non-specific LBP conditions. Conventional interventions used are heating modalities, manual therapy and exercise therapy. The result is that the addition of kinesiotaping to conventional interventions is significantly able to reduce pain and disability in acute non-specific LBP patients<sup>16</sup>.

Kinesiotaping works by stimulation on the mekanoreceptor that produces afferent input for pain blockade at the spinal level. This mechanism is based on gate control theory. Kinesiotaping also works by creating a space between the skin and fascia that leads to an increased supply of blood vessels and lymphatic drainage that helps reduce the process of easing and speed up the tissue healing process. The use of kinesiotaping in this study was from a causal towards cranial direction, with a pull level of 15% - 25%. This mechanism of kinesiotaping installation will inhibit the work of hyperactive muscles (spasms). This mechanism of habition will reduce muscle spasm and normalize muscle performance. This will affect the intensity of pain, range of movement and tolerance of activity. Another mechanism explains the effects of kinesiotaping through stimulation of the Golgi receptor. These receptors are activated in hypertonic muscles (spasm muscles), which causes stimulation of motor neuron inhibitors. Kinesiotaping activates the Golgi receptor, which causes decreased muscle spasms. Stimulation of keratinocytes, which serve as mechanical

transducers through mechanical stimulation of kinesiotaping causes  $ca^{2+}$  flow stimulation to evoke a response in adjacent C-fibers<sup>16</sup>. With this kinesiotaping mechanism, functionally some problems in myogenic LBP patients can be solved significantly. So that with the improvement of functional conditions in myogenic LBP patients, other disability conditions included in the 10 MODI disability conditions can decrease, so that patients can move independently and optimally.

The implications of the results of this study both theoretically and practically are in addition to the science and guidelines in providing effective interventions for myogenic LBP. The limitation of this study is that no medium- and long-term research was conducted to determine the effects of kinesiotaping on the rehabilitation of musculoskeletal conditions especially in myogenic LBP patients. The new knowledge resulting from this study is that physiotherapy modalities continue to develop, both in terms of shape and effect. Kinesiotaping as a new modality is able to significantly increase physical activity in patients experiencing low back pain. That kinesiotaping is also effective for reducing pain through the mechanism of mechanoreceptor activation, of course this function helps people who have problems with taking drugs. Through this study, individual changes that occur are an increase in functional activity and productivity. Clinically there will be changes in physiotherapy management guidelines on the condition of low back pain. Changes that occur at the policy level are the results of this study will support a regular review of physiotherapy methods to keep updated. This will have a positive impact on all parties.

## CONCLUSION

Based on the study, judging from the characteristics of the sample, the age of patients experiencing myogenic LBP is ranging in age from 30-50 years. In terms of gender, men experience more myogenic LBP than women. In terms of BMI, overweight samples were more susceptible to myogenic LBP. Statistical test results in the control group showed that microwave diathermy and massage interventions significantly reduced disability in myogenic LBP patients. Statistical test results in the treatment group showed that interventions in kinesiotaping, microwave diathermy and massage significantly decreased disability in myogenic LBP patients. Statistical test results showed that interventions in kinesiotaping, microwave diathermy and massage decreased disability more than microwave diathermy and massage interventions in myogenic LBP patients.

Further research is needed to control the physical activity of the sample, smoking habits and nutrition of the sample. In addition, it is necessary to conduct advanced research to determine the medium- and long-term effects of kinesiotaping on myogenic LBP patient rehabilitation programs.

## CONFLICT OF INTEREST

The authors declare no conflict of interest

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