Effectiveness Combination Muscle Energy Technique and Strain Counterstrain Lumbar and Functional Changes to The Range of Motion in Patients With Non Specific Low Back Pain

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ABSTRACT

Non Specific Low Back Paingenerally caused by community activities such as sitting, standing, lifting, and household activity in the long term. The purpose of this study was to determine the difference in effectiveness between the combination of muscle energy technique, strain counterstrain and muscle energy technique on changes in lumbar ROM and functional in patients. This research was a quasi-experimental design with randomized control group pre test - post test. The research was conducted in the village of Gattareng Bulukumba, the sample was a patient Non Specific Low Back Pain in accordance with the inclusion criteria. The number of samples is 22 people who were randomly divided into 2 groups: the treatment granted MET and SCS 11 persons and a control group was given MET as many as 11 people. Based on the analysis of paired samples t in the control group obtained a value of p <0.05 for the ROM of flexion, lateral flexion and lumbar functional, which means that the MET and SCS intervention can result in increased ROM extension, lateral flexion and lumbar significant functional. While the treatment group also obtained a value of p <0.05 for ROM extension, lateral flexion and lumbar functional, which means that the MET intervention can result in increased ROM extension, lateral flexion and lumbar significant functional. Based on independent sample t test obtained by value of p <0.05 for ROM extension, lateral flexion and lumbar functional, which means that intervention SCS MET and MET was not more effective than to increase ROM extension, lateral flexion and lumbar functional. The MET and SCs are not significantly more effective than the MET to increased ROM extension, lateral flexion ROM, and functional ability in patients with Non Specific Low Back Pain.

***Key words** : Muscle energy technique, strain counterstrain, rom lumbal, fungsional lumbal, non spesifik low back pain*

INTRODUCTION

Low back pain can be caused by various activities and work risks such as work attitude (sitting, standing, lifting), household activities, and psychosocial stress (Jung Seok Lee, 2016).

This work attitude will obviously cause a heavy postural load. If this postural load occurs for a long time, it will cause postural strain for the back muscles. This condition will reduce blood flow to the muscles so that there is a chemical imbalance in the muscles. This can cause discomfort in the back area so that workers can limit their abilities optimally (Natosba, 2016).

The diagnosis of Low Back Pain is divided into two, namely Specific and Non-Specific Low Back Pain, In Specific Low Back Pain, there are certain pathophysiological mechanisms that cause symptoms such as infections of the spine, hernia nucleus pulposus, osteoporosis, rheumatoid arthritis, fractures, and tumors. In contrast to non-specific low back pain, where it is generally said that 80-90% of non-specific causes of low back pain are mechanical, and based on this percentage, 65-70% have no specific cause (Santosa, 2011).

Non-specific low back pain is the most common back pain, it is estimated that 70-80% of the entire population has

experienced non-specific low back pain in their lifetime.

The prevalence of non-specific low back pain in France is 15-45%, while non-specific low back pain in America mostly occurs in adults aged 20-69 years with a prevalence of 13.1%.

(Ni Wayan et al, 2015). Only 15% of non-specific low back pain can be identified, while the remaining 85% are non-specific (Vivek et al, 2018).

Every year the incidence of non-specific low back pain in the world is between 40%-50%. Meanwhile, a review of various studies conducted in Italy showed the prevalence of non-specific low back pain within 12 months between 33%-86% occurred in the Italian community.

A study conducted in Turkey reported that the incidence of non-specific low back pain in the community was between 62%-88% (Greg et al, 2016). Based on the Copcord Indonesia report (Community Oriented Program For Control of Rhematic Disease) shows that the prevalence of non-specific low back pain is 13.6% in men and 18.2% in women (Paramita, 2014).

Based on the results of observations in the Manunggal Hamlet, Gattareng Village, Bulukumba Regency in January 2019 it was found that as many as 22 non-specific low back pain patients with complaints that were generally found were motion pain and limitations of lumbar motion, thus limiting lumbar function.

Based on the results of observations in the Manunggal Hamlet, Gattareng Village, Bulukumba Regency in January 2019 it was found that as many as 22 non-specific low back pain patients with complaints that were generally found were motion pain and limitations of lumbar motion, thus limiting lumbar function. Based on the researcher's observations, most of the complaints were caused by work activity factors, where in general the sample did work in a bent position when farming/gardening. This position is often repeated in a static position for a long time, which can cause postural strain on the back muscles.

There are several intervention methods for non-specific cases of low back pain, one of which is the provision of Muscle Energy Technology (MET) and Strain Counterstrain (SCS). This technique is designed to reduce pain and increase lumbopelvic ROM. Based on the results of research conducted by Marzouk A. Ellythy (2015) showed that giving Muscle Energy Technology (MET) combined with Strain Counterstrain (SCS) showed an increase in lumbar ROM and was effective in reducing pain than only Muscle Energy Technology (MET).

Muscle Energy Tecnique has been shown to be effective in reducing lumbopelvic pain. Muscle Energy Technology has also been shown to increase the lumbar range of motion (ROM) in patients with non-specific low back pain. In a case study report on non-specific low back pain it was also shown that Counterstrain Strains are effective in reducing pain.

When the Counterstrain Strain and Muscle Energy Tecnique were used in the treatment of Low Back Pain, both were found to be equally effective in reducing pain after eight days of intervention. (Vivek et al, 2018).

Based on the description of the problem above, the formulation of the research problem is whether there is a difference in effectiveness between the combination of muscle energy technique +

strain counterstrain and muscle energy technique on changes in lumbar ROM and functional in patients with non-specific low back pain?, and the purpose of this study was to determine the difference in effectiveness between the combination of muscle energy technique, strain counterstrain and muscle energy technique on changes in lumbar ROM and functional in patients with non-specific low back pain.

PROCEDURE AND METHODS

This research was an experimental research with randomized pre test – post test control group design. This study consisted of 2 sample groups, namely the treatment group which was given the Muscle Energy Technique and Strain Counterstrain intervention and the control group was given the Muscle Energy Technique intervention.

The population was patient all non-specific low back pain lives in Dusun Manunggal, Gattareng Village, Gantarang District, Bulukumba Regency. The sample of this study was all patients with non-specific low back pain who met the inclusion and exclusion criteria in this study. The sampling technique used is simple random sampling.

Inclusion Criteria

1. Patients with chronic non-specific low back pain (> 3 months)
2. Age 35-45 years oldKriteria Inklusi
3. The results of the physiotherapy examination found the presence of:

a. Pain due to lumbar extension and lateral flexion lumbal

b. Limited lumbar extension and lateral motion

c. Positive JPM test in affected lumbar segment

d. Palpation of the quadratus lumborum and erector spine muscles found tenderness

e. Willing to be a respondent and follow the given therapy program

Exclusion criteria

1. Patients who have a history of HNP, spondylolisthesis, thoraco-lumbar vertebra fracture, lumbar vertebral tumor
2. Patients with low back pain who are over weight/obese

The Sample size this results of the sample calculation, the number of samples was 11 people, the number of samples was divided into two groups, namely 11 people in the control group and 11 people in the treatment group so that the total sample was 22 people.

Data analysis

1. Descriptive statistical test, to describe the characteristics of the sample based on age and gender.
2. Test the normality of the data, using the Shapiro Wilk test to determine if the data is normally distributed ($p>0.05$) or not normally distributed ($p<0.05$).
3. Comparative analysis test (hypothesis test): if the results of the data normality test show that the data is normally distributed, then parametric statistical tests are used, namely the paired t sample test and the independent t sample test. If the results of the data normality test are not normally distributed, non-parametric statistical tests are used, namely the Wilcoxon test and the Mann-Whitney test.

RESULTS AND DISCUSSION

Table 1 shows the mean and percentage values

Sampel characteristics	Treatment Group			Control Group		
	n	Mean	SB	n	Mean	SB
Age (year)	11	40,45	3,045	11	40,00	3,317
Sex	n	%		n	%	
Male	4	36,4		5	45,5	
Female	7	63,6		6	54,5	

based on age and gender characteristics. Judging from the age obtained a value of 40.45 ± 3.045 years for the treatment group and a value of 40.00 ± 3.317 years for the control group. This shows that the average sample belongs to late adulthood/old age in both the treatment group and the control group. Meanwhile, based on gender, in the treatment group, there were 4 male samples (36.4%) and 7 women (63.6%), in the control group, 5 male samples (45, 5%) and 6 women (54.5%).

Tabel 2
Mean LGS (derajat) and ODI based on pre test, post test and diffrence

Kelompok Sampel	Mean and Standard Dev		
	Pre test	Post test	Difference
ROM Ekstensi: Treatmen Group	14,09º ± 2,39	27,18º ± 2,14	13,09º ± 2,12
Control Group	14,27º ± 3,23	25,55º ± 2,296	11,00º ± 1,95
ROM Lateral Fleksi : Treatment Group	18,55º ± 2,51	30,91º ± 3,65	12,36º ± 2,46
Control Group	18,09º ± 4,01	28,91º ± 3,67	11,73º ± 2,28
ODI Treatment Group	29,64 ± 3,075	10,55 ± 2,54	18,18 ± 3,74
Control Group	29,64 ± 10,95	11,27 ± 3,003	18,00 ± 2,97

Based on the table above, the mean values of ROM extension and lateral flexion, as well as ODI in the treatment group are:

a. ROM extension: the pre test value was 14.09 ± 2.39 and post test was 27.18 ± 2.14 with a mean difference of 13.09 ± 2.12, which means an increase in ROM extension with an average increase of 13.09 degrees after being given the intervention of MET and SCS.
b. Lateral flexion ROM: the pre-test value was 18.55±2.51 and post-test was 30.91±3.65 with a mean difference of 12.36±2.46, which means an increase in lateral flexion ROM with an average an increase of 12.36 degrees after being given the intervention of MET and SCS.
c. ODI: the pre-test value was 29.64±3.075 and the post-test was 10.55±2.54 with a mean difference of 18.18±3.74, which means that there was a decrease in ODI score or lumbar functional improvement with an average decrease of 18.18 after being given the intervention of MET and SCS.

Then, in the control group, the mean values of ROM extension and lateral flexion, as well as ODI, were:

a. ROM extension: obtained pre test value of 14.27 ± 3.23 and post test of 25.55 ± 2.296 with a mean difference of 11.00 ± 1.95, which means an increase in ROM extension with an average increase of 11. 00 degrees after being given the MET intervention.
b. Lateral flexion ROM: the pre-test value was 18.09±4.01 and post-test was 28.91±3.67 with a mean difference of 11.73±2.28, which means an increase in lateral flexion ROM with an average an

increase of 11.73 degrees after being given the MET intervention.

c. ODI: the pre-test value was 29.64±3.202 and the post-test was 11.27±3.003 with a mean difference of 18.00±2.97, which means that there was a decrease in ODI score or lumbar functional improvement with an average decrease of 18, 00 after being given the MET intervention.

Tabel 3
Mean difference pre test and post test intervention in the treatment group

Data Group	Pre test	Post test	t	p
Ekstensi				
Mean	14,09	27,18	-20,4888	0,000
Standar Deviasi	2,386	2,136		
Lateral Fleksi				
Mean	18,55	30,91	-16,665	0,000
Standar Deviasi	2,505	3,646		
ODI				
Mean	29,64	10,55	24,478	0,000
Standar Deviasi	3,075	2,544		

Based on the table above, the results of the paired sample t test are p value <0.05, which means that the MET and SCS interventions can have a significant effect on changes in ROM extension and lateral flexion, as well as lumbar functional improvement in patients with non-specific low back pain.

Tabel 4
Mean difference pretest and postest intervention in the control group

Data Group	Pretest	Postest	t	p
Ekstensi				
Rerata	14,27	25,55	-20,222	
Standar Deviasi	3,228	2,296		0,000
Lateral Fleksi				
Mean	18,09	28,91	-13,222	0,000
Standar Deviasi	4,011	3,673		
ODI				
Rerata	29,64	11,27	18,318	0,000
Standar Deviasi	3,202	3,003		

Based on the table, the results of the paired sample t test are p value <0.05 which means that the MET intervention can have a significant effect on changes in ROM extension and lateral flexion as well as lumbar functional improvement in patients with non-specific low back pain.

Table 5
Different test of mean lumbar ROM and ODI after intervention between control and treatment groups

	Treatment Group	Control Group	t	p
Ekstensi				
Mean	27,18	25,55	1,730	0,099
Standar Deviasi	2,136	2,296		
Lateral Fleksi				
Mean	30,91	28,91	1,282	0,215
Standar Deviasi	3,646	3,673		
ODI				
Mean	10,55	11,27	-0,613	0,547
Standar Deviasi	2,544	3,003		

Based on the table above, the results of the independent sample t test are obtained, namely the p value> 0.05, which means that there is no significant difference between the treatment group and the control group. This

shows that there is no difference in effectiveness between the combination of Muscle Energy Technique (MET), Strain Counterstrain (SCS) and Muscle Energy Technique on changes in range of motion and lumbar functional in patients with non-specific low back pain..

DISCUSSION

1. Sampel Characteristik

   The description of the sample in this study consisted of a description based on age and gender. Based on the results of research conducted by Garg in Andini in 2015 showed that the incidence of Low Back Pain mostly occurs at the age of 35-55 years and increases with age. The sex that suffers the most from Non-Specific Low Back Pain is female because physiologically, women's muscle ability is lower than that of men. So that in their activities, women receive more workloads than men.
2. Effect of Muscle Energy Technique on changes in ROM and lumbar function in patients with Non-Specific Low Back Pain.

Based on hypothesis testing using the paired sample t test, p value <0.05, which means that the combination of Muscle Energy Technique and Strain Counterstrain can provide significant changes in ROM extension and lateral flexion of the lumbar and lumbar functional in patients with non-specific low back pain. Non spesifik low back pain can cause limitation of lumbar motion. This is due to dysfunction of the facet joints with spasm of the paravertebral and quadratus lumborum muscles. This problem causes limitation of extension and lateral flexion, which causes disability in the patient.

Muscle Energy Technique is a soft tissue manipulation method that uses appropriate contraction efforts from the patient accompanied by active mobilization or stretching or actively assisted. This technique is proven to increase ROM based on the results of this study and previous studies. This can be achieved because the Muscle Energy Technique has two physiological principles that form the basis of treatment, namely post isometric relaxation (PIR) and reciprocal inhibition (RI). Post-isometric relaxation refers to the assumption that a decrease in muscle tone will occur in a muscle or muscle group after a short period of isometric contraction. While the concept of reciprocal inhibition occurs when a muscle contracts isometrically, the antagonist will be inhibited and will show a rapid decrease in tone after the contraction.

The provision of Muscle Energy Technique in this study was aimed at the problem of muscle spasm in the quadratus lumborum muscle and facet joint dysfunction using 2 methods. The first method in the Muscle Energy Technique can produce a relaxing effect on the tightness of the quadratus lumborum muscle through the post isometric relaxation effect.

The second method in the Muscle Energy Technique can improve facet joint dysfunction and relaxation in the quadratus lumborum and lumbar erector spine muscles through activation of the quadratus lumborum, lumbar erector spine, and external-internal oblique muscles. The improvement of lumbar ROM produced by Muscle Energy Technique can restore the functional ability of patients with non-specific low back pain, where the patient can return to move freely in his vertebrae

(especially the lumbar) without complaints when performing functional activities.

3. The results of this study are supported by research by Ravichandran Hariharasudhan And Janakiraman Balamurugan (2019) regarding "A randomized double-blinded study of the effectiveness of the strain counter-strain technique and muscle energy technique in reducing pain and disability in subjects with mechanical low back pain" The Energy Technique is effective in the treatment of non-specific low back pain, especially in reducing pain, increasing lumbar ROM and functional impairment in the lumbar spine. Effect of Muscle Energy Technique and Strain Counterstrain on changes in lumbar ROM and functional lumbar in patients with Non-Specific Low Back Pain

Based on hypothesis testing using the paired sample t test, p value <0.05 was obtained, which means that the Muscle Energy Technique intervention can increase the ROM of extension and lateral flexion of the lumbar and lumbar functional significantly in patients with Non-Specific Low Back Pain.

It has been explained that the Muscle Energy Technique can increase lumbar ROM through a post isometric relaxation effect, where this effect can reduce tight muscle tone, especially the quadratus lumborum muscle. Increased tone in tight muscles is caused by hyperactivity of gamma motor neurons. The presence of stimulation of the Golgi tendon organs through post isometric relaxation will produce an inhibitory effect on the gamma motor neurons, resulting in a decrease in gamma motor neuron activity, and finally a decrease in muscle spasm.

The addition of Strain Counterstrain after the application of Muscle Energy Technique can optimize treatment results in the form of muscle relaxation. Strain counterstrain (SCS) is a positioning release method by passively positioning the joint into a position that gives rise to the most comfortable feeling or a pain reduction technique through continuous reduction and retention of inappropriate proprioceptor activity. The mechanism of strain counterstrain in reducing pain is by automatic resetting of muscle spindles which will change muscle tone and muscle neuromuscular activity. Application of a counterstrain strain on the quadratus lumborum muscle by providing a comfortable or relaxed (shortened) position for 60 – 90 seconds can allow the muscle spindle to slow down the frequency of afferent/sensory impulses associated with nocisensory. Then, the quadratus lumborum muscle is returned to a neutral position to avoid re-excitation so that it will help normalize tone and lengthen the spasm or tight quadratus lumborum muscle.(Jones, 2012).

The effectiveness of the Strain Counterstrain technique can be explained by the proprioceptive theory which states that Counterstrain Strains correct aberrant neuromuscular activity by muscle spindle-mediated or inflammatory reactions mediated by the sympathetic nervous system. According to proprioceptive theory, the neuromuscular imbalance created by continuous stimulation of the muscle spindles, can be reduced by passively shortening the muscles involved. Strain counter strains also allow normal muscle spindle activity to return (Sakina et al, 2014).

The results of this study are supported by Marzouk A. Ellythy (2015) on "Efficacy of Muscle Energy Technique Versus Strain Counter Strain on Low Back Dysfunction" shows that Muscle Energy Technique and Strain Counterstrain are effective techniques in reducing pain and functional improvement in patients with non specific low back pain.

3. The effectiveness of the combination of Muscle Energy Technique, Strain Counterstrain and Muscle Energy Technique on changes in lumbar ROM and lumbar function in patients with Non-Specific Low Back Pain.

Based on hypothesis testing, the results of the independent sample t test were obtained, namely the p value > 0.05, which means that there is no significant difference between the treatment group and the control group. This shows that Muscle Energy Technique (MET) and Strain Counterstrain (SCS) are not more effective than Muscle Energy Technique for changes in ROM and lumbar function in patients with Non-Specific Low Back Pain. The difference in the intervention between the two sample groups was the addition of a Counterstrain Strain in the treatment group. It has been explained that Counterstrain Strains have a relaxing effect (decreased muscle tone) through automatic resetting of muscle spindles which will change muscle tone and muscle neuromuscular activity. Giving a comfortable or relaxed (shortened) position for 60 – 90 seconds can allow muscle spindles to slow down the frequency of afferent/sensory impulses associated with nocisensory.

However, the success of Counterstrain Strains in treatment is strongly influenced by placing the limb into a comfortable position and achieving high relaxation in that comfortable position for 60 - 90 seconds. In the study, this was the researcher's obstacle in placing the patient's limbs into a comfortable position, where some patients did not achieve high relaxation after placing the limbs. into a comfortable position.

However, judging from the mean value of the difference, there was only a slight difference where the treatment group with the addition of a Counterstrain Strain resulted in slightly larger changes in ROM and lumbar function than the control group without a Counterstrain Strain. A previous study by Vivek Ineshbai Patel et al (2018) on "Effect Of Muscle Energy Technique With And Strain Counterstrain Technique In Acute Low Back Pain" which compared the effects of Muscle Energy Technique and Strain Counterstrain with Muscle Energy Technique with a sample of 50 people with ages between 35 to 45 years were divided into two groups. The results showed that Muscle Energy Tecnique proved effective in reducing pain in the lumbopelvic. Muscle Energy Technology has also been shown to increase the lumbar range of motion (ROM) in patients with non-specific low back pain.

Case study reports on non-specific low back pain also show that counterstrain strains can effectively reduce pain. When the Counterstrain Strain and Muscle Energy Tecnique were used in the treatment of Low Back Pain, both were found to be equally effective in reducing pain after eight days of intervention. (Vivek et al, 2018).

Laporan studi kasus pada *non-spesifik low back pain* juga menunjukkan bahwa *Strain Counterstrain* efektif dapat mengurangi rasa sakit pada, laporan studi kasus pada *non-spesifik low back pain* juga menunjukkan bahwa *Strain Counterstrain*

efektif dapat mengurangi rasa sakit. Ketika *Strain Counterstrain* dan *Muscle Energy Tecnique* digunakan dalam pengobatan *Low Back Pain*, maka keduanya ditemukan sama efektifnya dalam mengurangi rasa sakit setelah delapan hari intervensi. (Vivek et al,2018).

CONCLUSION

1. Muscle Energy Technique and Strain Counterstrain interventions can have a significant effect on changes in the lumbar range of motion (ROM) and lumbar function in patients with non-specific low back pain.
2. Muscle Energy Technique intervention can have a significant effect on changes in Range Of Motion (ROM) and lumbar functional in patients with Non-Specific Low Back Pain.
3. The combination of Muscle Energy Technique and Strain Counterstrain is as effective as the Muscle Energy Technique for changes in Range Of Motion (ROM) and lumbar functionalities in patients with Non-Specific Low Back Pain.

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