

# EFFECTIVENESS OF NECK CALLIET EXERCISE AND MUSCLE ENERGY TECHNIQUE IN NON-SPECIFIC NECK PAIN

Citra Ayu Milenia Noor Adi Putri, Mei Kusumanigtyas,  
Yulianto Wahyono

Study Program of Physiotherapy, School of Health Polytechnics,  
Ministry of Health Surakarta

## ABSTRACT

**Background:** Non-specific neck pain (NNP) affects 30-50% of the general population, and it often leads to severe disability. Neck calliet also known as isometric neck exercise is an exercise people can do at home when they have neck pain related pathology such as slip disc at cervical region, cervical spondylosis. Physiotherapist are often prescribed people this exercise when they have acute pain. This study aimed to determine the effectiveness neck calliet exercise and muscle energy technique in non-specific neck pain.

**Subjects and Method:** This was a randomized controlled trial conducted in Setda Kudus District Office and Badean 1 primary school, in Bondowoso, East Java. A sample of 38 employees with non-specific pain were selected for this study. This sample was randomized into two groups: neck calliet exercise (n=19) group and muscle energy technique (n=19) group. The dependent variable was non-specific neck pain. The independent variables were neck calliet exercise or muscle energy technique. QVAS was used to measure pain. Mean differences between the two groups both before and after intervention were tested by independent t test.

**Results:** Before intervention the mean QVAS score difference between the neck calliet exercise group (Mean= 50.88; SD= 7.27;  $p < 0.001$ ) and the muscle energy technique group (Mean= 52.98; SD= 5.86;  $p < 0.001$ ) were statistically non-significant ( $p = 0.334$ ). The comparability of pain scores between the two groups before the intervention indicates the success of randomization. After intervention the mean QVAS score in the neck calliet exercise group (Mean= 36.67; SD= 5.44;  $p < 0.001$ ) was lower than that in the muscle energy technique group (Mean= 40.70; SD= 4.78;  $p < 0.001$ ), and it was statistically significant ( $p = 0.020$ ).

**Conclusion:** Neck calliet exercise is more effective than muscle energy technique in reducing non-specific neck pain.

**Keywords:** neck calliet exercise, muscle energy technique, non-specific neck pain, employees

## Correspondence:

Citra Ayu Milenia Noor Adi Putri. Study Program of Physiotherapy, School of Health Polytechnics, Ministry of Health Surakarta. Jl. Adi Sumarmo, Tohudan, Colomadu, Surakarta, Central Java. Email: citraadiputri@gmail.com Mobile: +628225115042.

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## BACKGROUND

A non-ergonomic sitting position coupled with a static position for a long time has the potential to cause complaints of musculoskeletal disorders. In ergonomic of work, one of the aspects

that are considered is the position of work. The same work position in a long time can cause disorders in the form of musculoskeletal pain such as neck pain according to Tarwaka et al. (2014) in Nadhifah et al. (2019).

According to Cooper et al. (2006) in Haryatno and Kuntono (2016), neck pain is the second largest musculoskeletal case after low back pain and is ranked fourth in the causes of disability measured annually. In 2010 about 14% to 71% of the world's human population had experienced neck pain which could cause disabilities in life by 33.6 million (Rodrigues et al., 2017).

Neck pain can be caused by trauma, inflammation or infection, rheumatic disorders, or congenital diseases, but most often the cause is not known for certain and no specific cause is labeled as non-specific neck pain (Bogduk, 1984 in De Koning et al., 2008). Non-specific neck pain or mechanical neck pain is the most common neck pain felt by workers. About 10% to 20% there is an increase in the incidence of non-population-specific neck pain every year. According to to Hudaya, (2009) around 16.6% of adults in Indonesia complain of discomfort in the nape or back neck area.

Physiotherapeutic interventions can be performed to reduce neck pain include ultrasound, micro wave diathermy (MWD), massage, traction, stretching, hold relax, myofascial release, exercise therapy, transcutaneous electrical nerve stimulation (TENS), and manipulation therapy. Methods that can be used to reduce neck pain are exercise therapy, namely neck cailliet exercise and muscle energy technique.

Neck cailliet exercise is exercise therapy for the neck with isometric contractions against maximum resistance and ending with relaxation and continued stretching. According to to Kisner et al. (2007) in Kusuma and

Trisnowiyanto (2019) this intervention has many benefits, including reducing pain, restoring joint motion to full ranges of motion (ROM), and flexing-spasm.

Muscle energy technique is a therapy that involves isometric muscle contraction of the agonist or antagonist muscles consciously in a controlled direction by resisting the resistance given by the therapist. Muscle energy technique involves positioning in limited muscle groups and joints, which aims to reduce pain, stretch tense muscles and fascia, lower muscle tone, improve local circulation, strengthen weak muscles, and mobilize joints that are experiencing limitations (Chaitow, 2006).

In the research conducted by Jehaman et al. (2020) proved that neck cailliet exercise is effective in reducing neck pain in administrative employees of the Hiliduho health center in North Sumatera. Research by Kusuma and Trisno-wiyanto (2019) showed that cailliet neck exercise and Mc. Kenzie neck exercises are equally good in reducing neck pain in myofascial neck syndrome.

Research by Osama and Rehman (2020) that comparing muscle energy techniques to mechanical neck pain proves that autogenic inhibition muscle energy techniques are more influential than reciprocal inhibition muscle energy techniques on mechanical neck pain management.

Based on the description above, the physiotherapeutic interventions chosen by researchers to reduce pain in non-specific neck pain are neck cailliet exercise and muscle energy techniques. Given the large number of non-specific

necks pain cases experienced by the community, especially office employees such as teachers and government employees and did not get treatment, researchers were interested in comparing whether there was a difference in the effect of neck cailliet exercise and muscle energy technique on workers who experienced non-specific neck pain. This study aimed to determine the different effects of giving neck cailliet exercise and muscle energy techniques on reducing pain in non-specific neck pain.

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## SUBJECTS AND METHOD

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### 1. Study Design

This study used a two-group pre-test and post-test design, conducted in Kudus Regency Regional Office on Jl. Simpang Tujuh No. 1 Kudus and Elementary school of Badean 1 Bondowoso on Jl. Mt. Haryono No.44, Badean, Bondowoso District, Bondowoso Regency, East Java and was carried out in June 2022 for 5 days.

### 2. Population and Sample

The study population was employees of the Kudus Regency Regional Office and SDN Badean 1 Bondowoso. S as many as 38 sub-jeks that have met the inclusion and exclusion criteria are divided into two groups at random. Group I (n=19) was given neck cailliet exercise treatment and group II (n=19) was given muscle energy technique treatment.

### 3. Study Variables

The dependent variables was pain. The independent variables were neck cailliet exercise and muscle energy technique.

### 4. Operational Definition of Variables

**Non-specific neck pain** is pain that is felt in the neck area but the cause is not clearly known and shows no signs of malignancy, trauma, or degeneration and is often associated with abnormalities of the musculoskeletal system in the neck due to static loads on the neck for a long time, posture when working poorly and accompanied by neck-specific examination results are negative.

**Neck cailliet exercise** is a neck exercise using isometric contractions against the prisoner to the maximum that ends with relaxation and continued with stretching.

**Muscle energy technique** is a therapeutic technique performed using isometric contraction of the antagonist muscles of the upper trapezius, sternocleidomastoideus and levator scapula muscles by fighting the resistance of 30% of the maximum resistance given by the therapist.

### 5. Instruments

Measurement of pain using QVAS. Pain is measured using a Visual Analog Scale (VAS) line that includes 4 questions about pain namely: (1) current pain, (2) average pain, (3) mildest pain, and (4) most severe pain. The calculation of the total QVAS score is by summing the scores of questions number 1, 2, and 4 while question number 3 is not included because at this point it is considered that the mildest pain is 0. Furthermore, the total score of question numbers 1,2 and 4 is divided by 3 and then multiplied by 10 so that it produces a value of 0 to 100 (Christensen, 2007).

## 6. Data Analysis

The hypothesis test was carried out 4 times: (1) pre and post-test differences in group I using paired sample t-test, (2) different pre and post-test tests in group II using paired sampel t-test, (3) post-test difference test group I and II using independent sample t-test, (4) average difference test, the greater the

average difference, the group showed better influence.

## RESULTS

### 1. Univariate Analysis

All subjects of the study were analyzed and grouped based on their respective teristik.

**Table 1. Characteristics of study subjects by gender**

Group	Category	Frequency (n)	Percentage (%)
Group 1	Male	3	15.8
	Female	16	84.2
Group 2	Male	4	21.1
	Female	15	78.9

**Table 2. Characteristics of study subjects by age and length of work**

Variable	Group	Min	Max	Mean	SD
Age (Years)	Group 1	23	57	44.42	9.38
	Group 2	26	57	41.00	9.89
Length of Services (Years)	Group 1	2	36	17.03	10.17
	Group 2	1	36	16.32	10.41

A total of 38 subjects selected by random sampling were divided into two groups. Group I (n=19) was given neck cailliet exercise treatment and group II (n=19) was given muscle energy technique. In group I there were 3 men (15.8%) and 16 women (84.2%), group II there were 4 men (21.1%) and 15 women (78.9%). The characteristics of subjects by sex in both groups are relatively the same, hence it is believed that the sexes do not affect the outcome. In group I the average of age was 44.42 years with standard deviation 9.38, while the average in group II is 41 years with standard deviation is 9.89. The average age in both groups is relatively the same, so it is believed that age does not affect the results. In group I, the average result of length of work was 17.03 years with the standard deviation was 10.17 while the

average in group II was 16.32 years and the standard deviation was 10.41. The average length of work in both groups is relatively the same, so it is believed that the length of work does not affect the results.

### 2. Bivariate Analysis

Test the normality of the data to determine the distribution of data in this study using the Shapiro-wilk test. The results of the data normality test in group I obtained values of  $p= 0.597$  and  $p= 0.264$ , while in group II it was  $p= 0.132$  and  $p=0.538$  which means all which means there is a difference of meaning. Based on these results, it is concluded that muscle energy technique affects reducing pain in non-specific neck pain or hypothesis 2 is accepted. The group I post-test and group II post-test using an independent sample t-test obtained a value

of  $p=0.020$  which means that there is a significant difference. Based on these results, it can be concluded that there is a difference in the influence between

neck cailliet exercise and muscle energy technique on pain in non-specific neck pain, or hypothesis 3 accepted.

**Table 3. Hypothesis test results**

QVAS	Mean	SD	p-value
<b>Pre-Intervention</b>			
Group I	50.87	7.27	<0.001
Group II	52.98	5.56	
<b>Post-Intervention</b>			
Group I	36.66	5.44	<0.001
Group II	40.70	4.78	

The average difference in group I was 14.51 while the average difference in group II was 12.28. The difference in the average pre-posttest of group I is greater than that of group II, so it can be concluded that neck cailliet exercise is more influential than muscle energy technique on the reduction of pain in non-specific neck pain thus hypothesis 4 is accepted.

## DISCUSSION

The results of this study are following the research conducted by Jehaman et al. (2020), Ali et al. (2021), Alpayci and İltter (2017), that neck cailliet exercise is effective in reducing pain. - Neck cailliet exercise is effective in reducing pain. The appearance of non-specific neck pain in the neck muscles is caused by several factors, one of which is a poor working position and working in a static position causing excessive use of the neck muscles. Excessive use of muscles causes fatigue in the muscles which will result in the onset of spasms in the neck muscles coupled with a poor working position will cause the muscles to tense and shorten. This situation causes complaints such as pain and stiffness in the neck.

Neck cailliet exercise can overcome neck muscle spasms, maintain or increase the strength of the neck muscles to obtain static and dynamic resistance of the neck, maintain the area of movement of the joints and the flexibility of the neck muscles, reduce pain and improve neck function and obtain correct posture with corrected muscle imbalance. Giving neck cailliet exercise refers to when isometric contractions occur, it will stimulate muscle receptors, namely Golgi tendon organs. The impulses received by the Golgi tendon organ will be passed by the afferent nerve to the dorsal part of the spinal cord and meet the inhibitor motor neuron. This can stop the motor impulses of efferent neurons, thus preventing further contractions whereby the Golgi of the tendons of the organ will naturally protect the reaction against over stretching. Then there is a decrease in muscle tone, then it produces relaxation in the muscles and muscle lengthening that occurs suddenly in all muscles under the influence of stretching, relaxation that occurs in the muscles can improve circulation in the area that experiences pain, so that the

substances that cause pain can be removed from the tissues and pain can be reduced (Jehaman et al., 2020).

The results of this study are in line with the research of Osama (2020), Sbardella et al. (2021) and Nugraha et al. (2020) where muscle energy technique affects non-specific neck pain. Muscle energy technique can reduce pain, strengthen weak muscles, stretch tight muscles and fascia, and to improve local circulation. The application of muscle energy technique - refers to the isometric contraction of the antagonist muscle of the intended muscle using a minimum resistance strength of 20-30% of the maximum muscle strength, then relaxation and - stretching involving respiratory control are carried out. Muscle energy technique using reciprocal inhibition - (RI) technique will facilitate muscle spindle so that stretch reflex occur in agonist muscles and relaxation in agonist's muscles. The muscle spindle will trigger nerve impulses that awaken the afferent nerve fibers, meet the excitatory motor neurons in the spinal cord and at the same time block the motor neurons so as to prevent over stretching and a decrease in muscle tone. which in turn produces relaxed and elongated muscles, as well as pain loss also occurs (Waxenbaum and Lu, 2021).

Both are equally effective in reducing pain in non-specific neck pain through isometric contractions. However, based on the results of data analysis, there is a difference in the average difference between neck cailliet exercise and muscle energy technique, where neck cailliet exercise the average difference is greater so

that it is proven to be more effective than muscle energy technique against reducing non-specific neck pain. This happens because neck cailliet exercise is applied directly to muscles that experience tension while muscle energy technique stretches muscles that experience tension indirectly.

In the next researcher, it is hoped that they can overcome the weaknesses in this study, namely: (1) to control the subject's activities as much as possible by giving a sheet/ leaflet of a good work position and what things can be done and should not be done (2) controlling medical mentosa of the subject's m even though it is difficult, to get better and maximum research results, and (3) teaching all subjects the neck cailliet exercise movement so that it can be done independently when the subject experiences complaints.

Based on the results of data analysis and discussion in this study, the clinical implications of this study are that the results of this study can be used to reduce pain in people suffering from non-specific neck pain who have the same characteristics as the subjects of this study.

#### **AUTHOR CONTRIBUTIONS**

Citra Ayu Milenia Noor Adi Putri, Mei Kusumanigtyas, and Yulianto Wahyono formulated research methods, took data, analyzed data, and compiled manuscripts.

#### **FUNDING AND SPONSORSHIPS**

This research did not receive funding and sponsorship from other parties.

## CONFLICT OF INTEREST

No conflict of interest in this study

## ACKNOWLEDGEMENT

Thank you to the Department of Physiotherapy, Poltekkes, Ministry of Health, Surakarta, and all those involved in conducting research.

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