

# THE EFFECTIVENESS OF FASCIAL MANIPULATION FOR NECK PAIN AMONG UNIVERSITY STUDENTS

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## Abstract

**Background.** Neck pain mostly occurs at 18 years of age, then the pain gradually increases and affects the postural of the body. Frequently, university student suffered from muscle spasms around the neck mostly caused by computer activities, body posture, and sports; moreover, the evidence increased that undergraduate students have a high prevalence of musculoskeletal symptoms. However, there are not study that analyze the effects of fascial manipulation in neck pain treatment.

**Purpose.** This study aimed to investigate the efficacy of fascial manipulation for neck pain.

**Methods.** This experimental study includes 30 university students with range from 18 to 32 years old which consist of 26 males and 4 females with neck pain and two physical therapy with experiences as the examiner who were recruited between Octobers 18, 2018 until May 16, 2019. The students were randomized into the fascial manipulation group and combination therapy group. Participants in the fascial manipulation group received an intervention which treated the fascia layer, while the combination group received ultrasound treatment and transcutaneous electrical nerve stimulation (TENS) concurrently. Both groups received 30 minutes of treatment and were followed - up after one week. The outcomes were evaluated by the Neck Disability Index (NDI), numeral pain rating scales (NPRS), and the cervical range of motion (CROM) before and after treatment using the cervical range of motion. The participants get to assessment and got the physical examination first before the treatment around neck, scapula, and thoracic areas for treatment.

**Result.** For all measurements, there were significant differences between pre- and post - treatment values, but no significant differences between the groups. At follow-up, the NDI for the fascial manipulation group showed significantly ( $p = 0,039$ ) better effects than the combination group.

**Conclusion.** Our study demonstrate that fascial manipulation has similar effects to combination therapy when used for neck pain.

**Keyword:** upper extremity, neck, fascial manipulation, combination therapy

## INTRODUCTION

Based on data from the Human Health Welfare database from 2012 until 2016, neck pain is the second leading musculoskeletal problem in Japan, following lower back pain [1](#)). Mostly affects young adults between the ages of 18 and 32 years; the occurrence gradually

increases as people age or if they do not attempt to correct the pain, which is usually done through rehabilitation [2](#)). The increased use of smartphones and computers can trigger or aggravate neck pain if these devices are used in the wrong position [13](#)). Consequently, musculoskeletal symptoms in the neck and

upper extremity are prevalent among 48 - 78% of undergraduate students 10).

There are two categories of neck pain. First is non-specific pain which is related to limited mobility in the cervical spine, neck muscle spasms, decreased movement, and pathological factors, such as stress. This kind of neck pain can be triggered pathologically, or from environment [11](#)). The second type of neck pain is specific pain, which can be defined by a special soft tissue injury around the neck area. Some evidence suggest that the prevalence of neck pain increases steadily with the age and occurs in young adults aged 18 years and older [5](#)).

The fascia is connective tissue layers that begins under the skin. It is not primarily composed of collagen fibers and is deeper than the epidermis; however, it is not structurally the same as epidermis layer. Recent reports address the possible involvement of the deep fascia in myofascial pain 8). The fascia also participates in mechano-transduction mechanisms, which converts the stimulus into electrical activity to interpret tension and mechanical force. Fascial manipulation (FM) is manual therapy treatment that can be used to treat the superficial or deep fascia. It focuses on treating the deep fascia and it is dysfunction. FM examines the biomechanical and relationship between muscle and the deep fascia, which are involved in pain, disabilities, and impaired movements. The area that affected because of neck pain is retro

and antero (antagonist for retro) caput area especially occiput (CP3), collum (Cl), thoracic (Th), and scapula (Sc).

The most common modalities used during physical therapy include ultrasound and transcutaneous electrical stimulation (TENS). Combining ultrasound and TENS in has been shown to describe the effect between the modalities and is thought. To enhance the effect of the treatment. A previous study demonstrated that this combination therapy provides more analgesic effects than injection and speeds up recovery 6).

Therefore, this study aimed to investigate the effects of these treatments, especially FM, disability, pain intensity, and functional movement, which involves stiffness and elasticity, among university students with neck pain.

## **PARTICIPANTS AND METHODS**

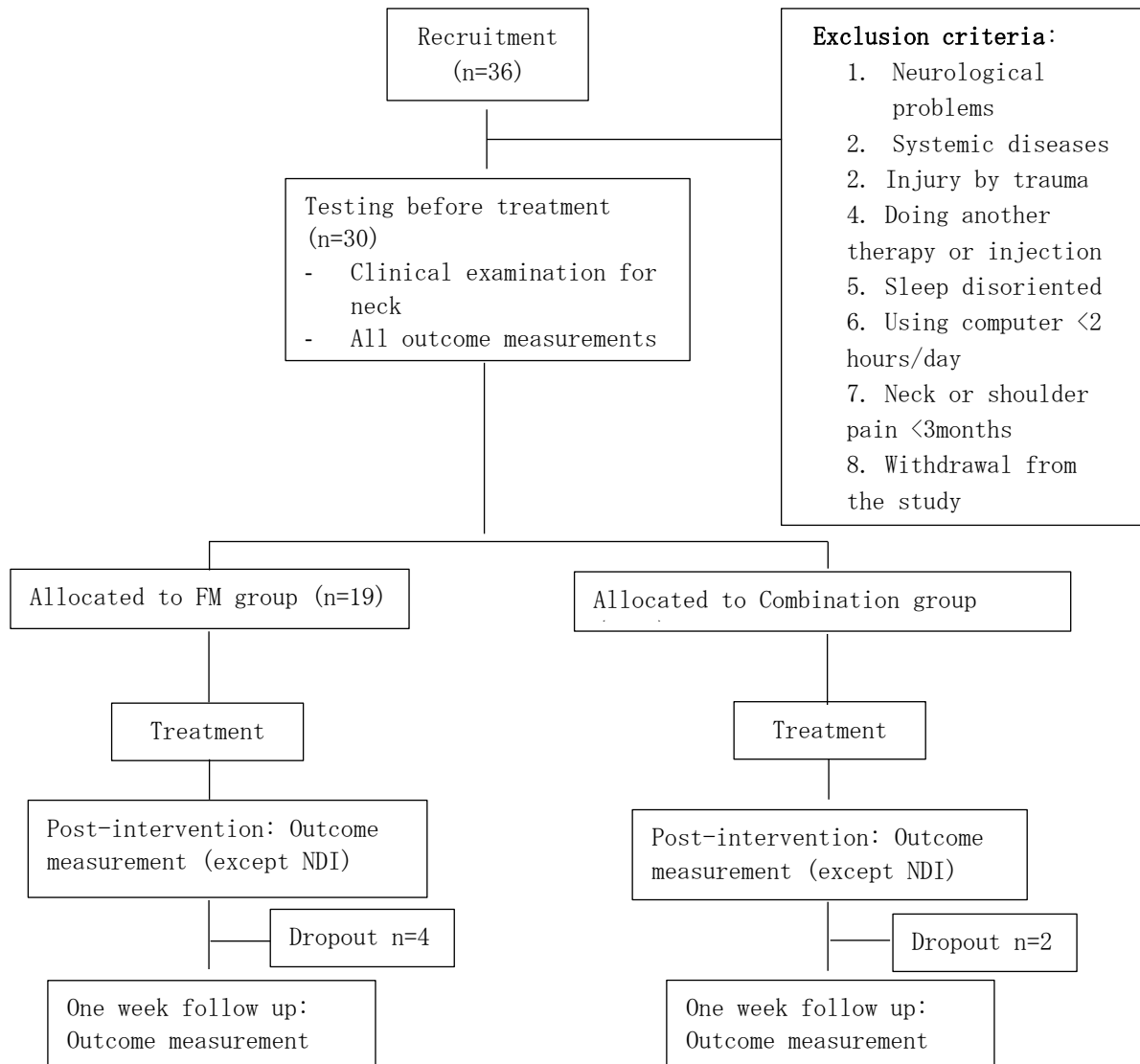
### ***Patients and ethical considerations***

This single-blind study included a randomized controlled trial, with FM and combination therapy (ultrasound and TENS) as the patient groups. Ethical approval was given by the Research Safety Ethics Committee of Tokyo Metropolitan University Arakawa Campus (Approval no.18061). Patients were recruited between October 18, 2018 until May 16, 2019. University students who were diagnosed with chronic neck pain (> 3 months of duration with daily manifestations), aged between 18-35 years, and signed provided informed consent were included in the study. Patients with neurological problems, systemic diseases, traumatic injury

around the head and neck, and those using a different therapy for neck pain were excluded from the analysis.

**Definitions.** Chronic pain is defined by separate criteria; these criteria include neck pain lasting longer than 12 weeks, no neurological problems, dull pain that worsens with sustained end-range spinal movements or positions, and

overpressure into tissue resistance. Based on the neck pain guidelines of 2017, chronic neck pain is classified based on limited mobility or radiating neck pain. However, only students with limited neck pain were included in this study. All participants agreed to avoid any additional therapy or treatment during the study.



**Figure 1.** Flow chart describing the progress of participant through the study

**Physical examination**

The physical examination for selected participants conducted in the following procedures. First, there were 2 physical therapy did the assessment protocol for

both groups was using standardization as movement and palpation verification in Fascial manipulation. To prepare the areas on neck and shoulder, the researcher already decided to minimize

the bias; the movement verification was performed only on the most painful and compromised movement that affected the myofascial units. Second, asked the participants to do the functional movement, extension the neck to see which side that has more extended and more deviation (re-cp3 and re-cl areas), instructed to moving the scapula closer together to see the rigidity (re-th), and the last one ask to raise both scapulae moving to the posteriorly and observe for dissymmetry of symptoms (re-sc).

Palpation verification only on the neck, shoulder, and upper back to decide which anterior path which becomes Centre of Coordination (CC) of the pain. The most painful area becomes CCs and those referring to the area for treatment.

#### **Outcome measures**

The outcome was measured using the Numerical Rating Scale (NPRS), for subjective feeling using the Neck Disability Index (NDI) in Japanese and English version, and neck range of motion using the goniometer. Not only that, to make sure to check which side the most affected is with neck pain, using the Fascial manipulation assessment checked was doing. The assessment area was in retro and anterior area in *caput* 3, *collum*, *scapula*, and *thorax*.

*Numerical Pain Rating Scale (NPRS)* was used as the pain scale at the start and end of each treatment session, and the last follow up after one week. The physiotherapist did the NPRS for pre- and post-treatment in order to evaluate whether the pain was sharp or the pain

present whenever the treatment was conducted.

*The Neck Disability Index (NDI)*. The NDI is an instrument that using functional activities as quantifier for neck pain. The scale is composed to measure the levels of disability caused by neck pain. It has 10 sections with total points is 50 to be measured: pain intensity, personal care (washing, dressing, etc.), lifting, reading, headaches, concentration, work, driving, sleeping, and recreation. Scoring ranges from 0 to 50 with minimum scores corresponding to a higher quality of life.

*Cervical Range of Motion (CROM)*. Neck or cervical range of motion was performed and digital measurement goniometer (DM-100) for pre-post-treatment and follow up after one week to see any significant differences before and after the treatment. The cervical movement that is assessed are flexion, extension, right and left side bending, and right and left rotation.

#### **Randomized and treatment group**

Participants come and conform to both fill the inclusion and exclusion criteria were randomized into a Fascial manipulation (FM) group or combination group using computer-generated a randomized list. Both groups have characteristic: the meeting only two days in two weeks (treatment day and follow up after 1 week), the duration of treatment both groups were 31 minutes, and each group has experienced physiotherapy for more than two years to assess the participants.

*Fascial manipulation (FM).* Around 30 minutes per sessions with the forces generated by a myofascial unit are considered to converge on one point which has a precise anatomical location within the muscular fascia. According to the Fascial manipulation model, musculoskeletal dysfunction is considered to occur when muscular fascia no longer slides, stretches, or adapts correctly, resulting in local fibrosis at these specific points of tension. The manual technique of Fascial manipulation will use knuckle or fingertips on the abovementioned points. This technique will do around the neck point or the point that give effect on neck pain. The point will be RE-CP3, RE-CL, RE-SC, RE-TH, (antagonist side) AN-CP3, AN-CL, AN-SC, and AN-TH.

*Combination therapy.* Ultrasounds perform almost at the same area as Fascial manipulation and will be done at 9 minutes. (1 watt/cm<sup>2</sup> dose, 1 MHz frequency, continuous mode). Ultrasound will be doing in trigger point on shoulder and neck areas. TENS using two electrodes to deliver a current premixed amplitude-modulated with <100 Hz frequency/pulse 60ms width and intensity adjusted according to the threshold for each participant without emerging pain or contractions. The electrodes are placed crosswise in the cervical paravertebral region.

## Procedures

In this study, at first do a questionnaire about personal and professional characteristics as well as specific questions regarding the Neck Disability Index, was developed for the students. This study will use the Neck Disability Index (NDI) in Japanese and English language. We used this questionnaire to get information about neck pain that affects the daily active life among students. The eligibility criteria are the students had neck pain more than three months with a maximum NDI score is 10, using the computer for more than 2 hours per day and had not responded to conventional conservative treatment. Active neck range of motion assessment is conducted in flexion, extension, rotation, and lateral rotation using goniometer. At the starting position, each participant looked forward with the neutral position then asked to move the heads towards each direction as far as possible, and the degree of neck motion would be recorded. Participants were followed in after first treatment and assessment for collecting data. It measured by goniometer for range motion. Then it would be doing another evaluation a week after the treatment. The allocation will be done with simple random sampling.

Outcome measurement	Group	Pre-treatment	Post-treatment	One-week follow-up
NDI	FM	7.2 ± 2.0	-	3.0 ± 2.7*
	Combination	8.3 ± 4.7	-	6.3 ± 4.6
NPRS	FM	3.8 ± 1.3	1.8 ± 1.0	1.5 ± 0.9
	Combination	3.3 ± 1.4	1.9 ± 1.1	1.8 ± 1.0
Flexion	FM	47.2 ± 14.7	58.7 ± 12.5	52.5 ± 12.6
	Combination	44.9 ± 12.9	49.8 ± 14.0	58.9 ± 15.5
Extension	FM	53.6 ± 13.7	63.8 ± 10.2	59.8 ± 13.0
	Combination	54.8 ± 11.0	60.7 ± 11.0	59.9 ± 15.8
Side bending (T)	FM	40.1 ± 10.0*	50.9 ± 14.5*	46.6 ± 8.3*
	Combination	30.5 ± 6.1	37.6 ± 9.7	38.7 ± 9.1
Side bending (NT)	FM	40.2 ± 14.7	43.9 ± 11.6	44.2 ± 9.8
	Combination	37.2 ± 11.5	39.4 ± 10.6	40.0 ± 13.3
Rotation (T)	FM	51.0 ± 14.0	59.7 ± 12.0	61.0 ± 12.2
	Combination	55.4 ± 9.5	63.5 ± 8.8	66.3 ± 10.4
Rotation (NT)	FM	55.9 ± 13.8	61.8 ± 13.4	61.4 ± 13.4
	Combination	62.5 ± 8.9	65.8 ± 9.0	63.0 ± 10.6

**Table 1.** The measurements results testing for effects of intervention

Variable	Time ( <i>F</i> value)	Group ( <i>F</i> value)	Time x group ( <i>F</i> value)
NDI	0.408 ( <i>p</i> = 0.001)	40.56 ( <i>p</i> = 0.092)	4.7 ( <i>p</i> = 0.039)
NPRS	36.84 ( <i>p</i> = 0.001)	0.004 ( <i>p</i> = 0.949)	1.63 ( <i>p</i> = 0.215)
Flexion	23.35 ( <i>p</i> = 0.001)	0.56 ( <i>p</i> = 0.46)	10.5 ( <i>p</i> = 0.001)
Extension	13.89 ( <i>p</i> = 0.001)	0.019 ( <i>p</i> = 0.89)	1.097 ( <i>p</i> = 0.348)
Side Bending Treat	22.11 ( <i>p</i> = 0.001)	10.19 ( <i>p</i> = 0.003)	1.59 ( <i>p</i> = 0.222)
Side Bending Non-treat	3.29 ( <i>p</i> = 0.53)	0.918 ( <i>p</i> = 0.346)	0.196 ( <i>p</i> = 0.823)
Rotation Treat	19.21 ( <i>p</i> = 0.001)	1.5 ( <i>p</i> = 0.23)	0.158 ( <i>p</i> = 0.854)
Rotation Non-treat	6.79 ( <i>p</i> = 0.004)	1.066 ( <i>p</i> = 0.311)	1.285 ( <i>p</i> = 0.293)

**Table 2.** Two-way repeated ANOVA results for analyzing the effects of each intervention

## Data Analyses

To analyze the data, we were using SPSS statistical software version 26 (IBM Corp., Japan version) for Windows. Descriptive statistics were calculated for all parameters. At first, divided the participants using the SPSS. Secondly, for each outcome parameter, a linear factors "time" (pre, post, and follow up) and the research group (FM and combination) to found out if there were significant differences between time and treatment. The dependent variables were analyzed using two-way repeated ANOVA. There was one between factor (group) within a factor of time (pre, post, and follow up) p-value was set at 0.05.

## RESULTS

### Participants

Thirty university students (26 males and 4 females) with a mean age were 27 years (standard deviation: 4.429) were randomly recruited between October 18, 2018 to May 16, 2019. Demographic features of participants in both treatment groups are summarized.

### Outcome measurements

#### *Numerical Pain Rating Scale. (NPRS).*

Based on the table 1, the interaction effect between the groups and the time (pre-treatment and at the follow - up) was statistically significant  $p = .039$ . there was a significant differences between time (  $p = .001$ ) but the difference between the groups was not significant ( $p = .092$ ) it shown there were no significant different in baseline with has improvement in NDI, pain, and range of motion. Both treatments showed

the same good result after the treatment. But, on FM group there were no improvement after one week not like the combination group. And on the table 2, the result talked about the relation between time, relation of group, and the differences between time and group. It showed that both groups did affect the process after the treatment ( $p < .001$ ). However, between the treatment, there are no significant different since both of group result gave the same effectivity for the neck pain. In the other hands, the FM has the main significant effect on ROM of side bending comparing two types of intervention ( $p < .003$ ). Only that measurement gave the different because since the beginning on the side bending treatment side already have differentiation based. Suggesting there are difference in the effectiveness between two interventions only for side bending in treatment area even there were no significant different between two treatment.

*Neck Disability Index (NDI).* The interaction effect between the groups and the time (pre-treatment and at follow-up) was statistically significant ( $p = .039$ ). There was difference between the treatment time ( $p = .001$ ), but the differences between groups was not significant ( $p = .092$ ).

#### *Cervical Range of Motion (CROM).*

*Flexion.* The differences between the two treatments and the times (pre-, and post-treatment, and follow up) were statistically significant ( $p = .001$ ), with

the most substantial differences being between the treatment times ( $p < 0.001$ ).

*Extension.* There was a significant difference in extension between the two-time groups ( $p < 0.001$ ). The differences in extension for analyzing the effects of each movement between the two intervention groups was not significant.

*Side bending.* The interaction between the group intervention and time groups (pre-treatment and at follow-up) in the treatment side was not significant ( $p = .22$ ). There was a significant difference between the time groups ( $p < .001$ ). Additionally, there was a significant difference between the interventions ( $p = .003$ )

## DISCUSSION

The results showed that Fascial manipulation has the same effect as combination treatment in reducing pain and improving neck ROM. However, the result in neck disability index (NDI) showed better than combination group.

The NDI was evaluated before the treatment and followed up after one week the treatment was performed. Mostly, when interview before re-evaluation, they feel no different whenever the interview asked what the feeling after one week without any treatment with doing the usual activity just like before the treatment was performed. But the participants feel the immediate effect after the treatment but no different after one week. Based on the result on the questionnaire, showed the different result. It showed better than before even they feel the same.

According to *Picelli A 12*), participants with the sub-acute whiplash who received FM for 30 minutes showed significant improvement in neck flexion after treatment; no differences were found between the groups for other primary outcomes after treatment or during follow - up. Compared to almost two weeks of neck exercise, functions of the neck significantly improved over time. Our study demonstrated that FM therapy improves neck flexion movement result after treatment, even though the results were similar to that of the combination group. Decrease in pain immediately following combination therapy; comparatively, ischemic compression treatment did not significantly improve pain. This study also demonstrated therapeutic effects after the first intervention. Similarly, in our study, both intervention groups demonstrated a decrease in the NDI and side bending on the treatment side an improvement in non-specific chronic pain. Our results suggest that there are no significant differences in the effects between FM and combination therapy. Both treatments have the same immediate effect after the first intervention and there were no significant prolonged effects measured one week after treatment. The present study is limited in that there are no control groups for comparison and NDI was not measured post - treatment. Despite these limitations, this study demonstrates the efficacy of combination treatment ultrasound and TENS for neck pain treatment. More studies are



warranted to fully elucidate the potential of combination therapy and FM among participants with neck pain.

The movement in FM and combination group showed the good result before and after treatment but there were no changes on both group after the follow up. In Fascial manipulation, it can be the effected due to restoration of fascial mobility and the quality of sliding motion between fascia layers [7\)](#). Because the concept of fascial manipulation it must be in the specific area and segmental of anatomical path; which may restore optimal motor unit recruitment [15\)](#). The movement in flexion became rising after the treatment change it until 10 degree even after finished the treatment. But the result did not stand too long because there were decrease after one week. It might be the effect of psychology that participants feel after the treatment. In the real time, participants that join the FM group, got pain at the beginning but not long after that they feel better. However, the combination group showed differently because after following up for one week the range of motion became increased. The combination just like mixing the effected of ultrasound and TENS. Ultrasounds have function as repair the soft tissue and TENS have stimulation for central nerve system. So that have combined the effected the soft tissue and stimulate the nerve to reduce the pain stimulus and make people condition calm and relaxed. But there is not clear evidence showed that combination

treatment using ultrasound and TENS in musculoskeletal problem, especially chronic neck pain, as one of the treatments. Because mostly therapist still using separately between ultrasound and TENS. Not only that, there are not many published studies that have analyzed the effects of combination therapy.

Even though, the result of this study revealed that the effects of FM and combination of TENS and ultrasound for non-specific chronic neck pain can be used.

#### **Limitation**

Limitation of the current study includes no control groups to compare, no post-treatment measurement on the NDI. This including the evidence of combination treatment ultrasound and TENS for neck pain treatment.

First limitation is this study is the absence of control group. The problem appears because of the limited number of participants and no matched schedule. Since there were no natural comparison with the natural condition of chronic neck pain.

Secondly, the evidence of combination treatment using ultrasound and TENS for neck pain intervention remains unclear. There are not many researchers talked about combining those two interventions for neck pain.

Lastly, the NDI score only has two measurements time (pre and follow up only). In this study, the NDI questionnaire talked about the participant daily life activity and it

was not possible to measure it for immediate effect after the treatment. Accepting these limitations, the study may be more provide the participant and the information further about combination therapy with ultrasound and TENS.

### CONCLUSION

There is no different effect between Fascial manipulation and combination treatment. Both interventions have the same immediate effect after the treatment on the first meeting. However, there is no significant prolonged effects measured one week after treatment.

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