

Effects of acupuncture on chronic neck and shoulder pain in individuals with office syndrome in Phayao, Thailand

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Received: 25 October 2021 **Revised:** 11 January 2022 **Accepted:** 16 January 2022 **Available online:** May 2022

DOI: 10.55131/jphd/2022/200210

ABSTRACT

Office syndrome is caused by prolonged sitting at work and ergonomically awkward working postures with repetitive use of the same neck and shoulder muscles. As a result, the posterior neck muscles for neck support work harder and causes tension in the muscles at the neck and shoulder areas, leading to pain and reduction of cervical range of motion. These symptoms can be cured with acupuncture. This experimental research study determined the effects of five consecutive acupuncture sessions on the visual analogue pain scale (VAS) and the cervical range of motion (CROM) in office syndrome patients with chronic neck and shoulder pain in Phayao Province, Thailand. All 40 volunteers (14 males and 26 females) were measured on the VAS and CROM scales before and after five acupuncture sessions. The acupoints in this study were Fengchi (GB20), Tianzhu (BL10), Bailao (EX-HN15), Dazhu (BL11), Jianjing (GB21), Jianwaishu (SI14), Jianzhongshu (SI15), Hegu (LI4), Taichong (LR3), and the trigger point. The data were analyzed into frequency distribution, percentage, mean, and median. In addition, the paired sample *t*-test for the VAS and CROM variables was used for the data comparison before and after the five acupuncture sessions. After five acupuncture sessions, our results showed that the VAS decreased from level 5 to level 1 whereas the CROM increased significantly in all directions including flexion, extension, left lateral flexion, right lateral flexion, left rotation, and right rotation (46.35 ± 11.35 vs 62.68 ± 8.66 , 52.18 ± 13.00 vs 68.09 ± 11.80 , 37.81 ± 7.07 vs 52.96 ± 8.72 , 37.57 ± 9.49 vs 49.96 ± 8.87 , 65.50 ± 14.38 vs 81.24 ± 10.59 , and 63.04 ± 13.41 vs 76.64 ± 10.61 ; $p < 0.01$, respectively). In conclusion, five acupuncture sessions for five consecutive days can reduce the chronic neck and shoulder pain from a level of 5 to 1 on the VAS. Additionally, volunteers were able to perform CROM in all directions more efficiently than the pre-treatment.

Key words:

chronic neck; shoulder pain; office syndrome; Thailand

Citation:

P. Siriteerathitikul, J. Sornsakdanuphap, S. Wongphon, P. Amput. Effects of acupuncture on chronic neck and shoulder pain in individuals with office syndrome in Phayao, Thailand. J Public Hlth Dev. 2022;20(2):126-136 (<https://doi.org/10.55131/jphd/2022/200210>)

INTRODUCTION

Chronic neck and shoulder pain is a symptom often found in musculoskeletal diseases. At present, the incidence of patients with this disease has been increasing continuously every year and is now ranked 3rd in Thailand¹. According to the study of Shariat et al. (2018), people who sit to work with computers longer than 8 hours a day experience neck pain (55.8%), right shoulder pain (58.6%), and left shoulder pain (55.8%), while 8.2% of the patients experience severe neck pain. These symptoms are called office syndrome² and are caused by prolonged sitting at work and ergonomically awkward working postures with repetitive use of the same muscles. While sitting at work, a prolonged forward head posture usually occurs and causes the cervical and thoracic spine to become curved and deformed. Compression may occur in the nerves, blood vessels, and spinal cord. Moreover, the posterior neck muscles for neck support work harder while the small muscles at the arms, hands, and shoulder joints are in a typing posture for a long time with little movement of the large muscles. These factors result in congestion of blood circulation, accumulation of carbon dioxide and lactic acid in muscles, and tension in the muscles at the neck and shoulders³, leading to pain and fatigue⁴. This pain usually occurs while sitting at work and sometimes it even occurs during break times. The pain is usually intermittent with the frequency of 1-2 instances a week. If it is not cured, it will be increasingly severe⁵⁻⁶ and become chronic. Consequently, the pain reduces the ability to do daily activities and lowers work effectiveness, leading to frequent absences from work. Facing prolonged pain affects the patients' mood and mind, and it causes stress which can make patients easily irritable. The patients incur expenses for medical treatment and

travel, but also earn less income⁷. Therefore, guidelines should be sought to solve these problems by placing importance on the treatment of those patients with office syndrome.

According to previous studies, treatments for neck and shoulder pain included the intake of non-steroidal anti-inflammatory drugs (NSAIDs⁸, steroid injections⁹, and surgery¹⁰. Although these treatments can reduce pain and increase the cervical range of motion and quality of life, the treatment with painkilling drugs usually cause side-effects such as gastric ulcers, nausea, vomiting, dry mouth, feeling dry, and constipation. In addition, prolonged steroid intake may lead to osteoporosis, adrenal gland malfunction, swelling of the face, cardiac arrhythmia, and hypertension. In the surgical treatment, the patients are at risk of surgical site infection, massive blood loss, blood congestion, and side-effects from fracture or dislocation of the implanted metal, numbness, or muscle weakness. In some cases, re-operation may be needed¹¹⁻¹³. To reduce such side-effects, acupuncture represents an alternative treatment for healing neck and shoulder pain in patients with office syndrome.

There is scientific evidence to verify that acupuncture can reduce neck and shoulder pain. In 2018, Ju¹⁴ studied the effects of 12 acupuncture sessions for 12 consecutive days in the treatment of chronic neck and shoulder pain caused by cervical spondylosis and nerve compression. That study found that the VAS decreased while the CROM increased in all directions. This finding is consistent with the study of Chen et al.¹⁵ (2020) on the effects of ten consecutive acupuncture sessions for curing chronic neck and shoulder pain caused by cervical spondylosis with nerve compression. They found that the VAS decreased, and the pain recurrence was reduced by up to 75%. In addition, the acupuncture side-effects with physical harm were not found in either the short or

long term. However, in previous studies, acupuncture for ten or more sessions may cause injury to tissues and capillaries at the acupuncture sites. The volunteers may experience pain and bruising from repeated acupuncture at the same site for a long time. Moreover, acupuncture consumes time and financial expense in terms of medication and travel¹⁴⁻¹⁵. In addition, previous studies have reported that exercise therapy, dry needling, and nonfunctional electrical stimulation on radicular pain for four sessions could reduce pain with lumbar flexion and increase the active range of motion of lumbar flexion in office workers with a history of chronic radicular lower back pain by radiating into the left leg (Hosseini et al. 2018)¹⁶. However, their results and discussion did not show the effect of each treatment to reduce pain and increase the lumbar range of motion. Therefore, this study is interesting in studying the effects of treatment for chronic neck and shoulder pain by using a total of five acupuncture sessions for five consecutive days. The acupuncture that was conducted five times, we have hypothesized, could reduce VAS of chronic neck and shoulder pain, and increase CROM in all directions more easily than the pre-treatment.

MATERIALS AND METHODS

Research design and setting

The study was conducted in Mueang Phayao District, Phayao, Thailand. This experimental research had the purpose to study the effects of five consecutive acupuncture sessions on the visual analogue pain scale (VAS) and the cervical range of motion (CROM). In the study, 40 volunteers were office syndrome patients with chronic neck and shoulder pain for at least three months in Phayao Province,

Thailand. Each volunteer was acupuncture once a day in a 30-minute session for five consecutive days, and no other treatments were performed during the acupuncture period. The acupuncture was performed by selecting the acupoints according to the theories of the meridian system¹⁷ and traditional Chinese medicine¹⁸. The selected acupoints included Fengchi (GB20), Tianzhu (BL10), Bailao (EX-HN15), Dazhu (BL11), Jianjing (GB21), Jianwaishu (SI14), Jianzhongshu (SI15), Hegu (LI4), and Taichong (LR3) (Figure 1). Before the treatment, all volunteers were assessed on VAS and CROM of the neck and shoulder muscles. Then, they were requested to be in a prone position while relaxing the neck and shoulder muscles. The researchers cleaned the acupoints with 70% alcohol according to the standard of the National Commission for the Certification of Acupuncture and Oriental Medicine (NCCAOM)¹⁹. After that, the acupuncture needles of 25 mm in length were used in acupuncture the selected acupoints at about 0.5 – 1 inches, depending on the volunteers' thickness of skin layer and muscles. The needle was manually activated to stimulate numbness and stiff pain (de qi) at all acupoints. Then, the needles were held at the sites for 30 minutes before being removed. After all five acupuncture treatments, all volunteers were reassessed on VAS and CROM of the neck and shoulder muscles. Throughout the acupuncture treatment five times for five consecutive days, the researchers requested the volunteers to stop receiving other treatments such as herbal compress massage, physical therapy, exercises with deep tissue relaxation, and intake of painkilling drugs. If the volunteers received these treatments or were exposed to other factors which stimulated more neck and shoulder pain, they were asked to report this to the researchers.

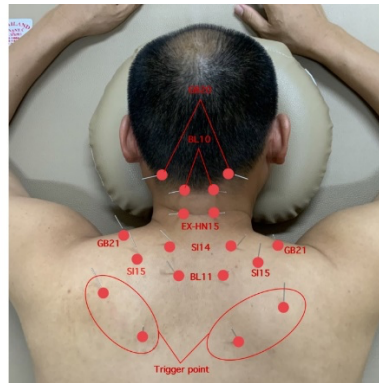


Figure 1 Acupuncture performed in subjects with chronic neck and shoulder pain

Study population

The volunteers in this study were 40 office syndrome patients with chronic neck and shoulder pain for at least three months in Phayao Province, Thailand. The sample size was calculated by referring to the study of Weerasak et al.²⁰ (2017) by using the G power 3.1 program with the predefined values of power at 0.80, effect size at 0.5, and Alpha level at 0.05. The resulting sample size was 35 volunteers and the dropout percentage was at 15%. As a result, the volunteers in this study were 40 subjects, and their basic description is shown in Table 1. The inclusion criteria were office syndrome patients with chronic neck and shoulder pain for at least three months from the causes of muscle problems or in combination with cervical spondylosis. The exclusion criteria were symptoms of neck and shoulder pain caused by accidents or post-surgical pain.

Instruments

The research instruments in this study were the visual analog pain scale and the fluid inclinometer, as described below.

1. Visual Analogue Pain Scale (VAS)

The pain scale was assessed by using the visual analogue pain scale (VAS) on a 10-cm horizontal straight line. The severity level was divided into 0 – 10, where 0 was on the left indicating ‘no pain’ and 10 was on the right indicating ‘the

worst pain’. The volunteers were requested to mark their average pain within the past day on a limiter on the horizontal line of the VAS scale in centimeters.

2. Fluid Inclinometer

The fluid inclinometer was used to measure CROM as described below.

2.1 Neck flexion and neck extension: The volunteers sat with a straight back on the chair and put their hands on the groin. The researchers placed the fluid inclinometer at the center of their heads and spinous process at the T1 level on the sagittal plane. After that, the volunteers performed neck flexion and neck extension at the location of the starting pain as much as possible.

2.2 Neck lateral flexion to left and right: The volunteers sat with a straight back on the chair and put their hands on the groin. The researchers placed the fluid inclinometer at the center of their heads and spinous process at the T1 level on the frontal plane. After that, the volunteers performed neck lateral flexion to the left and right at the location of the starting pain as much as possible.

2.3 Neck rotation to left and right: The volunteers lay on their backs. The researchers placed the fluid inclinometer at the center of their foreheads on the transverse plane. After that, the volunteers performed neck rotation to the left and right at the location of the starting pain as much as possible.

Each posture was measured three times with a 30-second interval between the measurements. The results of three tests were averaged to reach a mean value used for the statistical analysis.

The reliability of VAS has an intraclass correlation coefficient (ICC) = 0.99²¹ and the reliability of the fluid inclinometer has ICC = 0.85-0.95²². Moreover, all instruments have ICC more than 0.80 indicating acceptable reliability²¹⁻²².

Ethical issues

This study was approved in terms of ethics of human research by the University of Phayao No. 1.3/013/64 on 7 April 2021. The research objectives were explained to all volunteers and they voluntarily gave their consent to participate in the study by signing the written consent form for the data collection.

Data collection

The data were collected from May 2021 to August 2021 by researchers and the research assistants. The general information of the volunteers was recorded encompassing sex, age, weight, height, duration of the neck and shoulder pain, and

medical history or history of operations and other injuries at the neck and shoulders. Before the acupuncture treatment, they were asked about their pain levels by using the VAS and CROM in 6 directions: neck flexion, neck extension, neck left lateral flexion, neck right lateral flexion, neck left rotation, and neck right rotation by using the inclinometer before and after the acupuncture treatment.

Data analysis

The general information of the volunteers was analyzed with descriptive statistics including frequency distribution, percentage, mean, and standard deviation by using the VAS median. Moreover, the paired sample *t*-test for the CROM variables was used for the data comparison before and after the acupuncture treatment. All data analyses were performed with SPSS version 26.0 at the statistical significance of $p < 0.05$.

RESULTS

According to the study results, the general information of the volunteers includes sex, age, weight, height, and BMI (Table 1).

Table 1 Characteristics of the subjects. Values are mean \pm SD

Variables	Mean \pm SD
Sex (F:M)	26:14 (n=40)
Age (years)	38.13 \pm 11.80
Weight (kg)	59.38 \pm 8.28
Height (cm)	165.80 \pm 7.38
BMI (kg/m ²)	21.63 \pm 2.85

In the comparison of the results before and after the acupuncture treatment for curing chronic neck and shoulder pain, it was found that after the acupuncture treatment, the measured pain was at 1 VAS point. See the result details in Table 2. The CROM increased significantly in all directions of flexion, extension, left lateral flexion, right lateral flexion, left rotation, and right rotation as shown in Table 3.

Table 2 Pain intensity before and after the treatment

Variables	Pre-treatment (n=40; F=26; M=14)	Post-treatment (n=40; F=26; M=14)
VAS	5/10	1/10

Table 3 The scores of Range of Motion (ROM). Values are mean \pm SD

Variables	Pre-treatment (n= 40; F= 26; M=14)	Post-treatment (n= 40; F= 26; M=14)	P -value
Cervical Range of Motion (CROM)			
neck flexion	46.35 \pm 11.35	62.68 \pm 8.66	<0.01
neck extension	52.18 \pm 13.00	68.09 \pm 11.80	<0.01
neck left lateral flexion	37.81 \pm 7.07	52.96 \pm 8.72	<0.01
neck right lateral flexion	37.57 \pm 9.49	49.96 \pm 8.87	<0.01
neck left rotation	65.50 \pm 14.38	81.24 \pm 10.59	<0.01
neck right rotation	63.04 \pm 13.41	76.64 \pm 10.61	<0.01

With statistical significance ($p < 0.01$) when compared to the pre-treatment

DISCUSSION

In the study, after the five acupuncture sessions of 30 minutes for five consecutive days, the volunteers' VAS decreased with statistical significance, and the CROM increased with statistical significance in the directions of flexion, extension, left lateral flexion, right lateral flexion, left rotation, and right rotation when compared to the pre-acupuncture status. According to the study of Zhang et al.²³ (2018) on the effects of ten acupuncture sessions conducted every other day within a period of 20 days for curing the chronic neck and shoulder pain caused by cervical spondylosis with nerve compression, it was found that VAS decreased whereas CROM increased in all directions. Moreover, the study of Wang et al.²⁴ (2020) on the effects of 14 consecutive acupuncture sessions for curing the neck

and shoulder pain caused by cervical spondylosis with nerve compression also found that VAS decreased with increased CROM in all directions. The findings from these previous studies were consistent with the findings in this study. It can be said that acupuncture for five sessions or ten sessions or more can reduce neck and shoulder pain and increase the cervical range of motion, but with differences in the pain severity levels. Based on the above-mentioned previous studies, the 'severe pain' before the treatment was lowered to the 'mild pain' after ten treatments. In the present study, however, the 'moderate pain' before the treatment was lowered to the 'mild pain' after five treatments. Therefore, the acupuncture for ten sessions or more can reduce the intensity of the neck and shoulder pain to a greater extent than the five acupuncture sessions. This indicates that continuous treatment, treatment frequency, and treatment periods may have

effects on the severity of pain levels. However, with the acupuncturing period for ten or more sessions for curing the chronic neck and shoulder pain in the previous studies, the high frequency of acupuncture may have some effect on the patients in terms of medical expenses, travel expenses, and absence from work. Moreover, the high frequency of acupuncture for consecutive days may cause the patients to experience pain, bruising, or ecchymosis on the skin at the acupuncturing sites. This study reduces the amount of acupuncture to five sessions for five consecutive days to study the resulting symptoms of the chronic neck and shoulder pain and the cervical range of motion. The results of the present study conform to those in the previous studies on the effectiveness in reducing chronic neck and shoulder pain and increasing CROM in all directions. The effectiveness of five acupuncture sessions in this study is nearly similar to the effectiveness of the acupuncture for more than ten sessions on consecutive days. The study performed acupuncture at the standard acupoints with indication of the traditional Chinese medicine for curing the pain from office syndrome. These acupoints used in this study include Tianzhu (BL10), Bailao (EX-HN15), Dazhu (BL11), Hegu (LI14), and Taichong (LR3). The acupoints of Tianzhu (BL10), Bailao (EX-HN15), and Dazhu (BL11) are the standard acupoints in traditional Chinese medicine for the particular treatment of the neck pain²⁵. The acupoints of Hegu (LI14) and Taichong (LR3) are often used together for stimulating blood circulation and meridian energy throughout the body. It is called the 4-gate opening method or *Kai si guan*, (Yang, 1997)²⁶, the main acupuncture theory, which was recorded in the ancient scripture *Huangdi neijing* of the Huangdi Emperor and the academic acupuncture scripture *Zhenjiu jiyijing*. These theories have been taught from the ancient times to the present. This method is used for

opening the meridians throughout the body for easy blood and meridian circulation. In addition, there are other acupoints for curing different symptoms and pain locations.

According to previous studies, the acupuncturing mechanism can be explained by science. The gate control theory of Melzack and Wall²⁷ (1965) explains that the signal of pain feeling is transferred along the nerve fibers and nociceptors to the dorsal horn of the spinal cord. This location is the entrance of pain as it contains substantial gelatinosa (SG cell) functioning to control the gate opening or closing of the spinal cord. The pain is taken to stimulate T-cells and is transferred to the brain. Therefore, when piercing the skin with the needle at the acupoints, the large nerve fibers in the muscles, such as A beta fiber (A β) and A alpha fiber (A α), are activated. These two nerve fibers can obstruct the pain signal by stimulating SG cells and T-cells to stop pain nerve signals to the brain (closing gate), resulting in no pain. When the needle is activated at the acupoint location to stimulate the stiff feeling, called *de qi*, the nerve signal can be transferred more quickly and suppress the nerve pain signal at the T-cell quickly²⁸. Meanwhile, it can stimulate endorphin secretion in the hypothalamus brain and pituitary glands to provide relief from pain²⁹.

Apart from pain suppression, acupuncture can also relax the muscle spasms at the neck and shoulders by piercing with the needle at the trigger points to activate the spinal cord reflex of the nerve system, leading to a local twitch response. The nerve network in such locations secretes neuropeptides and causes the expansion of the blood vessels, and increases the blood circulation to nourish the body tissues. Consequently, the tissues can perform self-repair, make the muscle spasm relax, and reduce the neurotransmitter secretion which causes

pain in such locations³⁰. This is compliant with the theory of meridian energy of traditional Chinese medicine. The needle pierces the trigger point and acupuncture point on the meridian energy line until there is numbness and stiff pain (*de qi*), which stimulates blood and meridian energy to flow effortlessly. This is called *Tongjing Huohuo*. When blood and meridian energy are normal, the muscles will be nourished and relaxed, and the pain is relieved³¹⁻³². When the pain level reduces, the muscles relax. The muscles are repaired and fully fostered in flexibility, so the cervical range of motion increases in all directions.

Therefore, various risk factors should be reduced, such as the daily activities of the volunteers, since these activities may cause changes in pain levels as well as costing both time and money. The five acupuncture sessions for five consecutive days is another alternative for patients with chronic neck and shoulder pain who find it inconvenient to travel or have limited time. Based on the results of this study, chronic neck and shoulder pain can be cured with five acupuncture sessions for five consecutive days in terms of reducing pain and increasing the cervical range of motion in all directions.

CONCLUSION

According to the study results, five acupuncture sessions for five consecutive days could reduce the chronic neck and shoulder pain from a level of 5 to 1 on the VAS. It also increased CROM in all directions more efficiently than the pre-treatment in volunteers with office syndrome. Therefore, it is one of the potential treatments for people who always work by sitting at the computer and may experience office syndrome.

LIMITATIONS OF THE STUDY

The present research studied the effects of five acupuncture sessions conducted as 30-minute sessions for five consecutive days for curing chronic neck and shoulder pain, and the cervical range of motion in all directions by comparing the results of the pain score and the cervical range of motion score before the 1st acupuncture and after the 5th acupuncture. The study results showed that five acupuncture sessions as 30-minute sessions for five consecutive days could reduce the neck and shoulder pain and increase the cervical range of motion in all directions. However, this study lacked a control group and the female/male ratio was not similar. Therefore, future studies should include a control group and the female/ male ratio should be in a similar proportion because previous studies have shown that females experience more pain than males. The factors causing females to experience more pain than males are that females usually have mood changes and stress to a greater extent than males, including changes in sex hormones. These factors can cause more muscle tension, resulting in the increase in muscle pain³³⁻³⁴.

RECOMMENDATIONS

Future research should involve a comparative study to compare the standard acupuncture and other acupuncturing types such as electroacupuncture (EA), Tuina massage, moxibustion, or combined treatments from traditional Chinese medicine in order to develop the guidelines for curing neck and shoulder pain in a more effective way.

ACKNOWLEDGMENTS

We are grateful to the School of Allied Health Sciences, University of Phayao, for lending us the research instruments and giving us advice for our research implementation. We would also like to thank the volunteers for their good cooperation in the data collection during the treatments.

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