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A Comparative Randomized Controlled Trial Study: The Effects of Court-Type Traditional Thai Massage plus Meditation versus Court-Type Traditional Thai Massage Only on Reducing Pain among the Patients with Myofascial Pain Syndrome

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Abstract

This study aimed to compare the effectiveness of Court-type traditional Thai massage (CTTM) with Meditation versus CTTM without meditation in decreasing pain stiffness and degree of cervical range of motion (CROM) on participants with myofascial pain syndrome (MPS) on the upper trapezius. The single-blind randomized controlled trial was conducted at Thammasat University Hospital comprising of 64 participants which equally divided into 2 groups. The treatment group received CTTM for 30 min plus meditation and the control group received only CTTM for 30 min each subject received the treatment twice a week for 4 weeks. Assessment of effectiveness was performed by comparing Visual analog scale (VAS), pressure pain threshold (PPT) and CROM were assessed at week 0 (baseline), week 1 - 4 (intervention) and week 6 (follow-up). The VAS and PPT pain score had shown significant differences in both the CTTM plus meditation and CTTM only groups ($p < 0.05$), whereas the CROM involving flexion, extension, left lateral flexion, and right lateral flexion increased significantly in the CTTM plus meditation but not in CTTM only groups at all assessment time points ($p > 0.05$). Moreover, all of the measurement were not significant between two groups. These findings showed that both CTTM paired with meditation and CTTM without meditation could alleviate MPS, as evidenced by improvements in VAS, PPT and CROM. Taken together, this research could provide an alternative for people who desire to improve their health by combining CTTM and meditation.

Keywords: Court-type traditional Thai massage, Meditation, Myofascial pain syndrome, Visual analog scale, Cervical range of motion

Introduction

MPS of the upper trapezius muscle is one of the most common causes of neck and shoulder pain [1]. The conventional definition of MPS is characterized by regional pain originating from hyperirritable spots located within taut bands of skeletal muscle known as myofascial trigger points (MTrPs). The pain caused by the presence of MTrPs, responsible for the MPS is very common, particularly after a trauma or sustained muscle fatigue. In addition, Simons and Travell study have previously described the prevalence of MPS. MPS is the most common musculoskeletal condition and it commonly afflicted muscle in people between the ages of 31 and 50 [2]. The incidence of neck and shoulder soreness was found to be 38.5 % in Thailand, according to epidemiological statistics on muscle disorders. It was discovered that women are larger risk than men. The condition usually strikes people between the ages of 50 and 60. Furthermore, according to the Thai Traditional Medicine Services Center, there were 274,188 and 88,871 patients with neck and shoulder pain and frozen shoulder, respectively, in 2015 [3]. The signs and symptoms related to MPS such as head and neck pain, muscle stiffness, restriction of movement, dizziness, sweating, insomnia, limit daily activities with a very high recurrence rate and maybe persist for long periods. It can be associated with lower socio-economic status and occupational factors such as static or repetitive tasks, uncomfortable positions, heavy loads, or physically demanding work [4]. However, 3 types of analgesic medicines are commonly used for the most common types of pain including opioids, acetaminophen, and nonsteroidal anti-inflammatory drugs (NSAIDs) [5,6].

The utilization of alternative medical treatments for many conditions has been increasing during recent years and massage has been documented as one of the most frequently used alternative treatments for musculoskeletal pain [7]. Therefore, these patients seek alternative methods such as traditional Thai massage to relieve their pain. Moreover, massage appears to reduces the chance of NSAIDs exposure in the patients which reduces the risk from its side effects such as gastric irritation [8]. Treatment of MPS focuses on alleviating TrPs, using the pharmacological method and non- pharmacological methods. Analgesics and NSAIDs such as ibuprofen, ketoprofen, acetylsalicylic acid, naproxen, diclofenac and paracetamol or acetaminophen are effective therapies in pharmacological method [9]. However, some patients have had negative effects as a result of using the medications mentioned above, which are very effective on the digestive system [10]. On the other hand, non-pharmacological methods like acupuncture, physical training, relaxation training can be used to calm the nerves and reduce pain sensibility in the central nervous system. Other non- pharmacological treatments include massage and meditation, usually used in alternative therapies with relatively minor adverse effects [11]. Thailand has a long history of traditional medicine including Traditional Thai Massage which was divided into 2 types: The popular type (Thai name- Cha Loei Sak) and CTTM. It is believed that traditional Thai massage originated within families as family members offered relief to one another by using various parts of their body to relieve muscle pain. This type of massage is called Cha Loei Sak, while CTTM is a procedure on the human body using only the finger and hands. The inherited art of healing, which is a type of massage, according to Thai traditional medicine, is focused at disease prevention, as well as the promotion and rehabilitation of human health [12]. For a long time, Thai traditional massage has been used to relieve pain [13]. According to studies, Thai massage can dramatically alleviate muscle pain, relax tight muscles, and improve flexibility, joint range of motion and blood circulation. Traditional Thai massage also lowers heart rate, increases breathing efficiency and promotes relaxation [14,15]. Apart from traditional Thai massage, meditation technique was also reported to be significant in reducing pain as well as chronic pain [16,17]. Meditation reduces pain via a variety of psychological and neurological mechanisms [18]. These include stress reduction, decreased anxiety [19]. Interestingly, previous studies have found that meditation has the potential to improve the immune systems of the body, which can help prevent and cure illnesses, which it has been linked to a variety of health advantages [20,21].

Thus, this study conducted a randomized clinical trial to compare the effectiveness of CTTM combined with meditation versus CTTM only in patients with MPS in the upper trapezius. The researchers wanted to see how effective Court-style traditional Thai massage mixed with meditation was on the visual analog scale, PPT and CROM. This research hypothesized that CTTM combined with meditation reduces pain more than without meditation in patients with MPS in the upper trapezius.

Materials and methods

This study was a single- blind randomized controlled trial, which the investigator blind conducted at the outpatients Thammasat University Hospital, Thailand. It was approved by the 1st Ethics Review Committee for Research Involving Human Subjects, of Thammasat University (MTU-EC-OO-1-199/60).

Participants and intervention

The sample size calculation based on previous study that the different level of pain measured by VAS, and the mean difference between a treatment ($\mu 1$) and control ($\mu 2$) were assumed to be $\mu 1$ (test) $-$ $\mu 2$ (control) = 0.93 [14]. The standard deviation ($\sigma 2$) was estimated at 1.2 [22]. By using the following formula for Equality trial [23]. The required sample size to achieve an 80 % power ($\beta = 0.84$) at $\alpha = 0.05$ for detecting such difference is 26 participants. With a projected dropout rate of 20 %, 32 participants per treatment group were needed. Consider;

$$n = \frac{2(Za + Z\beta)^2\sigma^2}{(\mu 1 - \mu 2)^2}$$

Seventy subjects with MPS, based on an orthopedist's diagnosis at the Thammasat University Hospital, were selected. The inclusion criteria were as follows: Have experienced spontaneous pain for longer than 6 months and that at least 1 trigger point is present in the trapezius muscles, trigger points will be diagnosed as the presence of focal tenderness in a taut band with pain recognition, jump signs and switch responses, moderate level of pain (VAS 4 - 6 score) and willing to participate in the research. At the time of the research, participants must stop using NSAIDs, and/ or other forms of treatment for at least 1 month.

Participants were excluded from the study if they had a history of contagious skin disease, muscle injury or inflammation, bone fracture and/or joint dislocation, open wounds, and cervical radiculopathy, as well as pregnancy or breastfeeding, a prevailing fever of over 37.5 °C, suffering from severe side effects of massage and hypertension. During their involvement, they obtained other sorts of treatment besides those suggested by the doctor, such as acupuncture and medical injection; and they failed to follow the research conditions or missed appointments.

Randomization

Sixty-four participants who meet the inclusion criteria were randomly divided into 2 groups (32 persons each group). To maintain concealment by the research assistant who did not participate in this study, the allocation sequence was carried out by placing the allotted cards in opaque, sealed and staple envelopes.

Treatment procedure

CTTM was administered to participants by qualified Thai traditional medical practitioners with more than 5 years of experience with the technique. Each participant received massage from the same therapist every time. The steps in the procedure are as follows: 1) A 15-min basic shoulder massage; The therapist starts by pressing the thumbs above the shoulder blades, 2 inches from the medial part of the shoulder tips, and then moving apply pressure along the upper trapezius muscle to the side of C7 spinous process. In sitting position, pressure from both thumbs were applied starting from shoulder to neck and neck to shoulder (upper trapezius muscle) for 3 rounds using light, medium, and strong pressure, respectively; 2) Thoracic vertebrae and cervical vertebrae massage (10 min); Using the thumb to press the lower corner of T1 and the upper corner of T1. Then, using the thumb in oblique position to press the lower corner of C7 and upper corner of C7; 3) Shoulder tip massage (5 min); the therapist sat on 1 knee on the side of the volunteers, using the thumb to press the center position on the clavicle, or the intersection between the inner clavicle and the vertical line from the earlobe both sides. CTTM massage procedures are shown in **Figures 1 - 3**. For Meditation procedure, there were 1 or 2 meditation instructors, who had finished at least 6 months session of Pra Arjarn Luang Phor Viriyang Sirintharo's Smathi curriculum or Vithuntasa Smathi 200 h, in this study. Every volunteer was informed about what would be the objectives procedure, the precaution and usefulness of meditation, before deciding to sign the consent form. The volunteers sat cross-legged for meditation and silently recited Bud-dho Bud-dho to accumulate their mind power at 1 selected location point of 3 location points i.e. forehead, heart area, or the naves. The selected location point was selected by individuals where they were most satisfied with which should not be changed later. Before the start of the current, the instructors taught the volunteers how to meditate on 1 day and then left them to practice on their own for 20 min a day for 7 days. Then, researchers appoint participants and start the research practice. In this study CTTM plus meditation group had to meditate for 20 min. After that, these participants were massaged for 30 min for each session. In CTTM only group, participants sat for 20 min and the received TTM massage 30 min. Both groups conducted twice days (day 1, and day 4) per week for 4 weeks.

Figure 1 Basic shoulder massage.

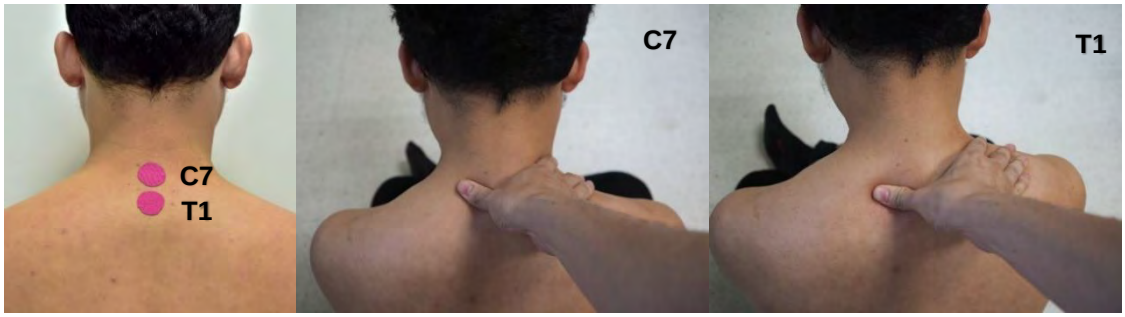

Figure 2 Cervical vertebrae C7 and T1 massage.

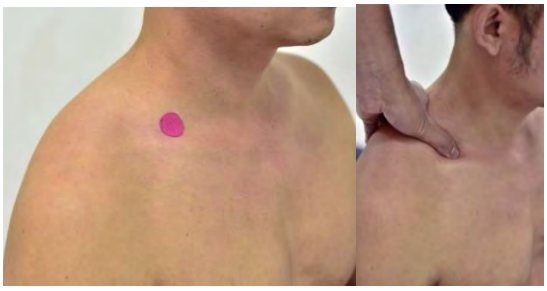

Figure 3 Shoulder massage.

Outcome measures

Assessment was performed on Day 1 of each week before receiving treatment. Both groups were assessed for VAS, PPT and CROM at week 0 (baseline), week 1st, 2nd, 3rd and 4th (intervention), and week 6th (follow-up after intervention). VAS consists of a score 0 - 10 with the endpoints defining extreme limits such as no pain (number 0) and extreme pain (number 10). Participants were asked to mark their pain level on the line between the 2 endpoints [24]. The average PPT of the trigger point also known as deep PPT or tenderness resistance on the upper trapezius muscles was determined from triplicated measurement using a digital pressure algometer [25,26]. CROM is used to measure flexion, extension, and lateral flexion of the muscle by CROM device with magnetic yoke [14,27].

Statistical analysis

Background characteristics data were presented as frequency, percentage, and mean ± standard deviation (SD). Data was analyzed using SPSS version 17. Statistical analysis was performed using Chi-square and F-test to compare the background characteristics data. Repeated measure ANOVA test was also used to analyze statistical differences of VAS, PPT and CROM within the group, and the determination of differences between groups were compared by independent- samples- t- test. The minimal level of significance was identified at $p < 0.05$.

Results and discussion

A total of 64 participants were recruited in this study. There were 32 participants who received CTTM plus meditation and 32 participants received CTTM only as a treatment. None of them were dropped out to the follow up during 6 weeks of the experiment. Demographic characteristics of the initial 2 allocation groups were comparable at baseline for gender, age, education, working posture and side of pain as shown in **Table 1**.

The effectiveness of the CTTM combined with meditation and CTTM only were gathered at baseline, week 1st, 2nd, 3rd, and 4th and week 6th follow-up. Participants in both groups described a decrease in VAS before treatment, as shown in **Table 2**. In comparison before treatment within groups, results showed that the VAS pain score was significantly different in both the CTTM plus meditation and CTTM only groups ($p < 0.05$). However, there was not statically different in VAS pain scores between groups. Overall, the findings showed that both treatments can reduce VAS levels, although there was no discernible difference between the 2 groups.

Table 1 Demographic characteristics of participants.

Characteristics	CTTM plus meditation (*N* = 32)	CTTM only (*N* = 32)	*p*-value
Gender[1]			
Male	5 (15.60)	4 (12.50)	0.63[a]
Female	27 (84.40)	28 (87.50)	
Aged (years)[2]			
Mean ± SD	32.81 ± 16.11	30.63 ± 12.16	0.71[b]
Education[1]			
Lower than bachelor's	2 (6.20)	3 (9.40)	0.69[b]
Bachelor's	19 (59.40)	20 (62.50)	
More than bachelor's	11 (34.40)	9 (28.10)	
Working posture[1]			
Sit	27 (84.40)	27 (84.40	0.25[b]
Walk	3 (9.40)	4 (12.50)	
Stand	2 (6.20)	1 (3.10)	
Side of pain[1]			
Bilateral	19 (59.40)	22 (68.80)	0.37[b]
Right	8 (25.00)	4 (12.40)	
Left	5 (15.60)	6 (18.80)	

[a] Chi-square test, [b] F-test, [1]Number of percentage, [2]Mean ± standard deviation.

PPT score, in comparison before treatment within groups, results showed that the PPT score was significantly different in both groups at all assessment time points ($p < 0.05$). In addition, the PPT score was significantly different between the group before treatment at baseline, week 3rd, and week 4th ($p < 0.05$). Hence, results of PPT demonstrate that both treatments enhanced the PPT score, and there was a significant difference between the 2 groups, as shown in **Table 2**.

Table 2 Comparison of VAS and PPT scores between groups.

Outcome	Group	Baseline	Week					[a]*p*-value
			1	2	3	4	6	
VAS	Treatment	5.16 ± 0.77	4 ± 1.32	3.75 ± 1.19	3.47 ± 1.48	2.28 ± 1.46	2.44 ± 1.61	0.00*
	Control	5.28 ± 0.85	4.25 ± 1.37	3.41 ± 1.56	2.94 ± 1.52	2 ± 1.61	1.91 ± 1.67	0.00*
	[b]*p*-value	0.54	0.46	0.33	0.16	0.47	0.20	
PPT	Treatment	5.68 ± 0.70	5.71 ± 0.57	5.53 ± 0.58	5.49 ± 0.66	5.57 ± 0.58	5.97 ± 0.97	0.02*
	Control	6.67 ± 1.28	5.93 ± 0.96	5.63 ± 0.79	5.96 ± 0.83	6.06 ± 0.65	6.28 ± 0.64	0.00*
	[b]*p*-value	0.00*	0.27	0.57	0.02*	0.00*	0.14	

Values are expressed in mean ± standard deviation.
[a]*p*-value is calculated by Repeated Measures ANOVA.
[b]*p*-value is calculated by Independent Samples t-test.
N = 32 in each group.
* = *p*-value < 0.05 is considered a statistically significant difference.

Table 3 shows CROM scores before treatment in both groups. When comparing the CROM scores within the group, results showed that in CTTM plus meditation group, the CROM scores involving the measurement of flexion, extension, left lateral flexion, and right lateral flexion were significant different as a great increase of the CROM was observed in groups at all assessment time points ($p < 0.05$). While the CTTM only group had significant differences in flexion alone at all assessment time points ($p < 0.05$).

Furthermore, no variations in CROM scores were found between groups. Overall, CTTM plus meditation outperformed CTTM alone, albeit there were no statistically significant differences between the 2 groups.

Table 3 Comparison of CROM scores between groups.

Outcome	Group	Baseline	Week					[a]*p*-value
			1	2	3	4	6	
CROM Flexion	Treatment	52.28 ± 10.97	55.16 ± 10.14	55.44 ± 11.05	58.59 ± 8.97	59.94 ± 8.95	59.72 ± 9.96	0.00*
	Control	50.63 ± 12.18	56.31 ± 8.82	58.47 ± 9.66	58.69 ± 9.15	60.62 ± 10.93	60.03 ± 10.10	0.00*
	[b]*p*-value	0.57	0.63	0.25	0.97	0.78	0.90	
CROM Extension	Treatment	50.69 ± 10.19	50.84 ± 12.81	50.16 ± 7.68	54.16 ± 9.60	56.44 ± 11.03	56 ± 9.06	0.00*
	Control	55 ± 13.88	54.22 ± 9.77	55.75 ± 10.41	56.19 ± 9.89	59.34 ± 10.51	57.97 ± 9.93	0.07
	[b]*p*-value	0.16	0.46	0.02*	0.41	0.29	0.41	
CROM Lateral right	Treatment	39.59 ± 7.50	40.03 ± 7.45	39.25 ± 6.10	40.94 ± 7.65	42.84 ± 8.07	42.75 ± 6.38	0.00*
	Control	40.34 ± 8.99	42.12 ± 8.98	40.28 ± 7.17	40.87 ± 8.78	42.37 ± 8.53	42.56 ± 8.03	0.18
	[b]*p*-value	0.72	0.31	0.54	0.98	0.82	0.92	
CROM Lateral left	Treatment	41.28 ± 8.04	41.91 ± 7.38	42.66 ± 6.17	43.94 ± 7.60	44.53 ± 7.95	43.53 ± 7.39	0.01*
	Control	41.09 ± 9.52	41.56 ± 9.25	42.88 ± 8.68	43.41 ± 8.31	42.81 ± 8.50	44.59 ± 8.74	0.07
	[b]*p*-value	0.93	0.87	0.91	0.79	0.41	0.60	

Values are expressed in mean ± standard deviation.
[a]*p*-value is calculated by Repeated Measures ANOVA.
[b]*p*-value is calculated by Independent Samples t-test.
N = 32 in each group.
* = *p*-value < 0.05 is considered a statistically significant difference.

Discussion

This study, the results showed that CTTM, both with and without meditation, is likely to be beneficial in lowering pain and increasing PPT and CROM in people with upper trapezius MPS. Three factors could be responsible for the decrease in pain levels and increase in PPT and CROM: Neurological, physiological and mechanical. Explanation of the neurological factor related to this study is the pressure from the massage decrease nerve conduction of small unmyelinated C-fibers that inhibit pain signals from entering the spinal segment, which is known as the gate control theory of pain [28,29]. In addition, it is suggested that massage stimulates the release of endorphins, which has morphine-like properties. It has the effect of reducing pain and helping to relax [30]. Several recent studies seem to have a universal agreement that meditation could reduce chronic pain conditions [16,17,31]. Analgesic mechanisms can be supported with the changes in the functions by the well experienced or trained of meditation. A briefed training on meditation for less than a week has the potential of providing significant reductions of pain intensity and disagreeableness rate of the participants [32]. Brown and Jones [18] claims that mindfulness meditation had no direct effect on pain sensitivity but anticipatory of pain was statistically significant. In contrast, the study conducted by Grant *et al*. [33] suggested that mindfulness meditation reduce pain levels. Conflict between these 2 studies possibly due to the different procedures of mindfulness meditation. Mechanisms of mindfulness meditation depended on the level of skill or consciousness technique [34]. Physiological element of the higher PPT and CROM levels could be explained by the increased biochemical compounds induced by massage, such as serotonin, a neurotransmitter that acts as a pain-controlling agent [35,36]. Concurrently, effect of the massage at the pressure point causes blood to deplete briefly while pressed, and on release will promote better blood circulation in the region. Furthermore, substances that cause pain, such as prostaglandin, decrease in the area as well. According to Kassolik *et al*. [38], the massage could stimulate pressure receptors called the pacinian corpuscle that located under the skin. This results in the dilatation of blood vessels (vasodilation) which increases blood supply to the area, resulting in reducing pain. The effect of CTTM combined with meditation result in increasing of PPT which seem to be in line with previous study by Boonrua *et al*. [14]. CTTM increased PPT and CROM in the upper trapezius, according to Boonrua and

colleagues. In other words, CTTM can relieve pain by reducing MTrPs in the muscle, a finding that has been replicated in numerous trials [15,37]. Massage induces the affected muscle to become more flexible, which is one of the mechanical components involved in the pressure created by massage. Massage pressure can stretch various muscle fibers and fibrosis, resulting in enhanced CROM, which implies greater muscle flexibility. In 2002, Simons [39] found that massage and stretching could cause contractions in muscle, returning them to the normal length, and leading to a decreasing in the sensitivity of muscle pain. From this study, the direction of muscle flexion is clearly increased, while the CROM of an extension has changed slightly. The area of studies is engaged with the following muscles: Splenius cervicis, splenius capitis and upper trapezius muscle [40]. CTTM causes positive mechanical effects, in other words, movement of muscle fibers helps to stretch the adjacent tissues to reduce the tension of the muscle. The more flexible muscles become to result in a better movement.

In this study, CTTM and meditation had an effect on pain chemical mediators, as well as PPT and CROM levels. This study, however, has certain problems. The 1st disadvantage is that some moderators might not have the requisite skills to completely benefit from meditation. Second, the vast majority of participants are continuing to work as usual, which may have an impact on the outcomes. Further research is needed to confirm the mechanism of effects of therapies in order to establish their efficacy and may apply to therapeutic use in patients with MPS in the upper trapezius. More research should be done comparing participants who have practiced meditation for more than 6 months with participants who have never practiced before in order to better understand the effects of meditation on muscle pain. This type of research will address the problem while also reducing the bias associated with various meditation techniques.

Conclusions

This study's findings show the impact of CTTM paired with meditation versus CTTM only. Both groups seemed to reduce VAS while increasing PPT and CROM, which involves measuring upper trapezius flexion, extension, left lateral flexion and right lateral flexion. CTTM with meditation produces slightly higher favorable effects than CTTM only.

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