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Thai massage using squeezed technique could relieve pain and stiff neck in neck strain patients

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Abstract

To verify the immediate and short-term effects of a modified traditional Thai massage (TTM) that uses a squeeze technique on the cervical range of motion (CROM), muscle pain intensity, pressure pain threshold (PPT), and muscle tension in patients with neck strain, a sample of 60 patients who had neck strain were randomly allocated to either a traditional Thai massage group that uses this squeeze technique once a day or a control group taking ibuprofen and rest for the same period. Outcomes such as CROM, pain intensity, PPT, and tissue hardness were assessed at baseline and immediately after the first treatment session. Daily follow-up over telephone on pain intensity was also conducted for three days. The TTM group showed significant improvements in their conditions after the treatment in comparison with the corresponding baselines of the other group ($p< 0.01$). The inter-group differences were 7.5 (95% CI 4.6-10.4) in flexion, 7.8 (95% CI 4.0-11.7) in extension, 8.1 (95% CI 3.45-12.7) in right rotation, 10.2 (95% CI 5.6-14.6) in left rotation, 7.0 (95% CI 4.6-9.4) in right lateral flexion, 5.8 (95% CI 3.1 to 8.6) in left lateral flexion, 0.7 (95% CI 0.3-1.1) in PPT, -7.2 (95% CI -11.1-3.3) in tissue hardness, -2.2 (95% CI -3.0-1.4) in the visual analog scale (VAS). The three-day follow-ups revealed that the pain intensity was assessed for each group and in inter-group comparison ($p< 0.01$). These results suggest that the TTM using the squeeze technique could increase the CROM and the PPT and decrease the pain intensity and tissue hardness in patients with neck strain.

Keywords: Squeeze technique, CROM, Massage, Neck strain

1. Introduction

Neck strain is one of the most common musculoskeletal disorders in physical therapy practice. It is found in around 6% to 22% of the general population and is more common in females than in males [1]. It has been empirically defined as a pain causing limitation in the movement of the neck because of neck muscle spasm resulting from a long day of hard work. The International Association For The Study Of Pain (IASP) has classified acute neck pain according to the duration of the symptom as usually a neck pain lasts for less than seven days [2]. Neck strain falls into this category. Even though the mechanism of neck strain is not understood well, it may be associated with many factors such as poor posture, overuse, repetitive injury, and prolonged stresses [3].

Moreover, prolonged contraction of the trapezius, weakness of the lower trapezius muscle, and tightness of the upper trapezius muscle can cause muscle strain in the neck [4]. The symptoms of neck strain include pain at the posterior neck that profoundly limits the cervical range of motion. These symptoms are always accompanied by tenderness on the cervical paraspinal muscles, trapezius, splenii, sub-occipitals, rhomboids, sternocleidomastoid, and levator scapulae. In addition, patients with neck strain complain of neck pain, stiffness, and muscle fatigue in the trapezius region-the inter-scapular region that always disturbs daily activities [5]. Many interventions have been suggested to treat neck strain, including rest, analgesic or anti-inflammatory drugs, acupuncture, physiotherapy, and massage [6]. However, taking these drugs may not be appropriate to ease the neck pain in patients with impaired liver function, gastrointestinal irritation, and renal disease. On the

contrary, the massage therapy has been found to provide immediate or short-term relief both in pain and tenderness, but with limited evidence [6,7]. However, it seems more appropriate in community settings because it is simple and could provide sedative effects to reduce pain and stress.

The traditional Thai massage (TTM) has a long history of relieving muscle pain and tightness associated with musculoskeletal disorders [8]. It includes many manual therapy techniques such as acupressure, kneading, rubbing along the ten meridian lines, and is always accompanied by muscle stretching at the end of the session. The commonly used techniques include acupressure and stretching exercise because they are believed to potentially release the blockage of energetic pathways (meridian lines). By undergoing the TTM, each essential acupressure point on the assumed energy paths is stimulated for 1-15 sec per point, which is repeated thrice [9,10]. Ischemic compression, a simple massage technique, could improve blood flow to the region affected by non-specific neck pain and to the upper trapezius trigger points [11]. In addition, Eungpinichpong and Kungnaka (2002) found that 15 seconds of manual ischemic compression on the femoral artery-a technique commonly used in TTM-could temporarily increase blood circulation to the distal region of the body part [12]. According to the literature, TTM could reduce pain mediator (substance P), stress mediators (cortisol level), muscle tension, and anxiety, while increasing the range of motion on neck pain and heart rate variability (HRV). It also relieves the symptoms associated with myofascial pain and scapulocostal syndrome [9,11,13-15]. Based on applying ischemic compression and combining it with active movements of the joint, which is called the squeeze technique, Eungpinichpong in 2007 introduced it as an additional form of TTM for treatment of patients with neck muscle strain. To apply this technique, a therapist grasps and gently squeezes the upper fibres of the trapezius muscle with fingers and thumb and holds them for 10-20 sec. During this period, the therapist asks the patient to move the neck in each cardinal direction until they reach the end of the range. After releasing the squeeze, most patients feel relief from restriction in the range of motion and pain. This technique can be an effective treatment for musculoskeletal pain syndromes, because a whole-body massage session always takes a longer time (1-2 h/sessions) and is not specific to the local problem. Practically, patients who have neck strain do not necessary require a whole-body massage. However, the precise and locally applied TTM that uses the squeeze technique has never been cited with evidence as an effective method of treatment for patients with neck strain.

This study aims to verify the immediate and short-term effects of the TTM that uses the squeeze technique. It is hypothesised that this treatment can immediately improve the cervical range of motion, relieve perceived muscle pain and tension, and increase the pressure pain threshold in patients with neck strain**.**

2. Materials and methods

2.1 Study design

A randomised, controlled, and open-labeled trial was conducted after the participants who met inclusion criteria were randomly assigned to either a TTM or a control group using a numerical sequence generated by a computer and their informed consent was acquired.

2.2 Participants

After being diagnosed by a medical practitioner, 60 participants with neck strain gave informed consent to participate in the study. They were recruited from Nongki district hospital, Thailand. Neck strain was defined as a disorder where the patient presented as neck pain with limited cervical range of motions, accompanied by tenderness of the posterior neck muscles without any neurological sign or bony fracture [4]. The inclusion criteria included the patients' gender, that they were aged between 20 and 60 years, had mild to moderate degree of neck pain in the visual analog scale ((VAS) score for pain 3-8 from the total of 10) and that the pain was present for a duration between 24 h and three months. Participants were excluded if at least one of the following conditions was reported: disease or disorder of the neck with neurologic disorders, radiculopathy, shoulder joint pain, psychiatric disorder, and infection or active inflammation [16,17]. Sample size was calculated using the formula $n/group = 2\sigma^2 (Z\alpha/2 + Z\beta)^2 / \Delta^2$ [18]. The input data were based on a pooled variance of a previous study with 80% power and a 20% dropout rate. Thus, the 60 subjects were recruited and randomly allocated into the two comparison groups.

2.3 Treatments

In the TTM group, each participant received a session of TTM with the squeeze technique administered by a licensed physiotherapist seating them in an upright position on a chair with a backrest. The physiotherapist stood behind the participant and applied gentle but firm squeeze with her thumbs and fingers on both upper trapezius muscle bulks simultaneously for 20 sec or until the participant felt a little discomfort. During this period, the

therapist asked the participant to slowly move the head to the end of each direction (flexion, extension, rotation, lateral flexion) (original figure 1) per round. After each round, the squeeze pressure was released. These procedures were performed thrice consecutively per day. Each of the participants in the control group was seated on the same chair for 60 sec without any massage. The medical practitioner administered to all participants in both groups 400 mg of ibuprofen three times a day, after meals, for three consecutive days. Each of them was followed up over telephone once a day for three successive days to assess the perception of pain intensity using a 0-10 verbal rating scale.

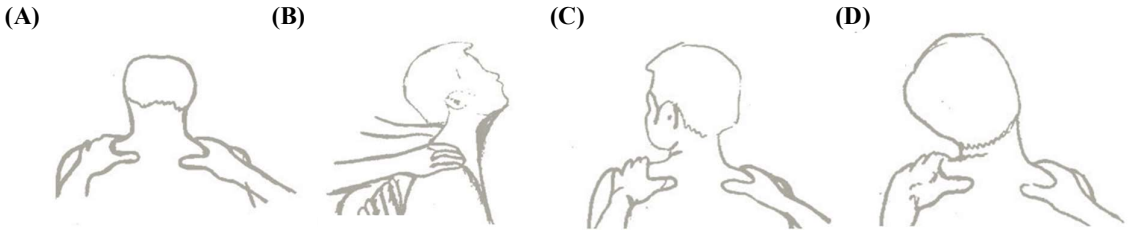

Figure 1 Squeezed pressure; (A) neck flexion, (B) neck extension, (C) neck rotation, and (D) lateral flexion.

2.4 Outcomes assessment

Demographic characteristics, including age, gender, weight, height, BMI, occupation by workload, stress level, and working status, were recorded before treatment. The clinical outcomes of the two groups, including VAS of pain perception, cervical range of motion (CROM), pressure pain threshold (PPT), and tissue hardness of the upper trapezius muscles, were assessed by a physiotherapist who was kept away during the group allocation at baseline and immediately after the first intervention. The follow-up on the verbal rating scale of pain over telephone once a day for three consecutive days was done by the same physiotherapist.

A cervical goniometer that had been tested for reliability was used to measure the cervical range of motion in all directions, which included cervical flexion, extension, lateral flexion, and rotation measured by the physiotherapist.This cervical goniometer was found to have high reliability in the measurements of cervical range of motion, with ICCs ranging between 0.89 and 0.98 [19,20]

The VAS is generally regarded as a valid and reliable tool for pain measurement. The summary ICC for VAS scores was 0.97. The reliability of the VAS for acute pain measurement as assessed by the ICC appears to be high [13]. The VAS is sufficiently reliable to be used to evaluate acute pain [21]. The standard VAS of 0 to 10 scale of pain was used to assess the pain intensity. The participants marked their current pain perception on a 10-cm line on the paper. The numbers 0 and 10 represented no pain and the most severe pain, respectively [21]. The pressure pain threshold on the trapezius muscle was measured using a tissue hardness algometer (OE-220, ITO Co. Ltd., Tokyo, Japan). This device has high reliability of PPT for individual muscle (ICCs 0.92) [22]. While using this device, the therapist exerted vertical pressure on a palpable point of tenderness on the trapezius muscle at a constant speed (1 kg/sec) [23]. When the participant felt just about to have pain, the participant pushed the patient-switch button with the beep sound, after which the PPT was recorded. The measurement was repeated three times to get the most accurate PPT value, and the averaged PPT was used for data analysis.

The tissue hardness of the trapezius muscle was measured using the same device by switching it to the tissue-hardness mode [24]. The pressure from the device was gradually and perpendicularly applied onto the skin where the most painful point was located on the trapezius muscle until a beep was heard. The device automatically recorded the tissue hardness as a percentage of that for the most rigid material. The measurement was repeated thrice, and the readings were averaged for analysis. The height reliability of the measurement on tissue hardness was recorded at the beginning of the study (ICC = 0.97).

2.5 Data analysis

The baseline characteristics, including the age, gender, height, and weight, were summarised as mean and SD. Independent t-tests were used to compare the outcomes and were performed with 95% confidence interval for inter-group comparison.

3. Results

The baseline characteristics of the participants are displayed in Table 1. There was no significant difference between the two groups in terms of their age, gender, height, weight, BMI, occupation by workload, stress level, and working status.

Table 1 Demographic and baseline clinical characteristics of patients with neck strain.

Characteristics	TTM	Control
Number of patients	30	30
Demographic data		
Age (years); Mean (SD)	37.3 (9.7)	38 (9.4)
Gender		
Female (%)	21 (70%)	19 (63.3%)
Male (%)	9 (30%)	11 (36.7%)
Weight (kg); Mean (SD)	61.2 (8.4)	61.6 (11.9)
Height (cm); Mean (SD)	159.5 (6.4)	161.9 (8.3)
Body Mass Index; Mean (SD)	24.5 (3.6)	23.5 (4.2)

In addition, the CROM, VAS, PPT, and tissue hardness before beginning the therapy sessions were also well balanced between the two groups (Table 2).

Table 2 Baseline of clinical outcome measures (mean and SD) in TTM and control groups.

Characteristics	TTM	Control	*p*-value
Cervical range of motion			
Flexion	34.5 (6.7)	33.9 (6.0)	0.75
Extension	40.5 (8.9)	39.9 (8.7)	0.79
Right Rotation	54.4 (10.8)	55.6 (7.2)	0.67
Left Rotation	54.3 (9.5)	53.8 (8.3)	0.81
Right Lateral flexion	34 (5.3)	32.4 (5.1)	0.24
Left Lateral flexion	33.3 (5.0)	32.9 (5.2)	0.75
Pain intensity (VAS 0-10 cm)	6.7 (1.8)	6.8 (1.4)	0.86
Pressure pain threshold (Kg/cm^2)	2.5 (0.8)	2.3 (0.6)	0.23
Tissue hardness	85.9 (7.3)	84.9 (6.6)	0.61

Note: TTM: traditional Thai massage using squeeze technique and ibuprofen, Control: rest and ibuprofen.

The results indicated improvements in the CROM, pain intensity, PPT, and tissue hardness in the participants in the TTM group immediately after receiving the treatment. Moreover, an inter-group comparison showed that the CROM and PPT were significantly higher in the TTM group. In contrast, the pain intensity and tissue hardness were substantially lower in the TTM group than in the Control (Table 3).

In the follow-ups on day 1, day 2, and day 3, both groups revealed that the pain intensity decreased slightly, but not significantly in comparison to the corresponding baseline values. However, inter-group comparisons during the three days revealed significant differences in pain intensity (Table 3).

No adverse effect of the treatment method was found in any of the participants during the study period. This study also showed that TTM using the squeeze technique had significant effects in all parameters, which ranged between 0.91–1.53 (Table 3).

Table 3 Comparison of means (SD) after treatment between the TTM and control groups by independent t-test).

Clinical Outcomes	After treatment			*p*-value	Effect size
	TTM	Control	Difference(95% CI)		
Flexion	39.8 (4.9)	32.3 (6.3)	7.5* (4.6-10.4)	0.001	1.34
Extension	46.2 (7.3)	38.4 (7.4)	7.8* (4.0-11.7)	0.001	1.06
Right Rotation	62.3 (10.7)	54.2 (6.7)	8.1*(3.45-12.7)	0.001	0.93
Left Rotation	62.9 (8.2)	52.7 (9.3)	10.2*(5.6-14.6)	0.001	1.16
Right Lateral flexion	39.5 (3.5)	32.5 (5.4)	7.0*(4.6-9.4)	0.001	1.57
Left Lateral flexion	39.2 (4.6)	33.4 (5.9)	5.8*(3.1 to 8.6)	0.001	1.12
Pressure pain threshold(kg/cm^2)	2.8 (0.8)	2.1(0.7)	0.7* (0.3-1.1)	0.001	0.91
Tissue hardness (%)	79.4 (8.5)	86.6 (6.8)	-7.2* (-11.1-3.3)	0.001	0.95
Pain intensity	4.7 (1.7)	6.9 (1.4)	-2.2* (-3.0-1.4)	0.001	1.45
follow up day1 (VAS)	4.5 (1.7)	6.5 (1.6)	-1.9* (-2.8-1.1)	0.001	1.20
follow up day2 (VAS)	4.5 (1.7)	6.8 (1.4)	-2.3* (-3.1-1.5)	0.001	1.53
follow up day3 (VAS)	4.4 (1.6)	6.2 (1.3)	-1.8* (-2.5-1.0)	0.001	1.22

Note: TTM: traditional Thai massage using squeeze technique and ibuprofen, Control: rest and ibuprofen.
*Significant difference between groups.

4. Discussion

This research has revealed the immediate and short-term effects of the modified TTM that uses the squeeze technique on the pain intensity, cervical range of motion, pressure pain threshold, and muscle tension in patients with neck strain. This TTM can be used as an alternative treatment for patients with neck strain in clinical practice. The improvements in each of the outcome measures are as follows.

4.1 Immediate effect on CROM

This study showed that a single session of TTM using the squeeze technique on neck strain for 20 sec three times a day is effective in increasing cervical range of motion in all directions. The inter-group comparison revealed a statistically significant difference between the two types of treatment immediately after the session. This result indicates that the patients receiving TTM using the squeeze technique have a more remarkable improvement in the neck's range of motion than the control group (Table 3).

A few proposed mechanisms could probably explain the increase in the CROM. Firstly, a temporary blockage to the muscle blood flow by the squeeze technique of TTM may result in a reactive increase in blood flow to the tight and painful muscles immediately after releasing the squeeze pressure, facilitating muscle relaxation [12]. As a result, the muscles could be relaxed and provide more range of motion to the cervical joints. Secondly, this squeeze technique might deactivate the trigger points in the affected muscles, commonly found in the upper trapezius muscle, especially in office workers. As the trigger points are deactivated by appropriate sustained pressure, muscle pain and spasm are released, resulting in an immediately increased range of motion of the affected joint. This mechanism has been supported by a preliminary study that found that ischemic compression was effective in reducing pain on the upper trapezius muscle [25]. Moreover, it might be explained by activating Golgi tendon organs situated in the trapezius muscle when the muscle was squeezed and held for three rounds of 20 sec. When the squeeze pressure was released, the post-isometric relaxation of the muscle occurred and increased ROM of the cervical joints [26].

4.2 Immediate effect on PPT

Comparisons of the outcomes between the groups showed that the TTM using the squeeze technique significantly increased the PPT on the trapezius muscle than the control group. This suggested that this technique could alleviate pain in the muscles of patients with neck strain by increasing the PPT. Again, this could be explained by the deactivation of the trigger point. The current study results align with a previous study that found that the TTM on the back region could increase PPT in patients with back pain associated with myofascial pain syndrome [2]. The mechanism of pain reduction and increased PPT could be explained by the neurological gate control theory. Massage using the squeeze technique may increase the PPT because its tactile and deep pressure could stimulate large fibres with fast conduction of nerve impulses and block smaller and slower nerve fibres that conduct pain sensation [27]. Therefore, this neural-gating mechanism that happens in the spinal cord could reduce pain and increase PPT.

4.3 Immediate effect on reducing muscle tension

The reduction in tissue hardness immediately after a session of receiving the TTM using the squeeze technique implied that the participants had reduced muscle tension. The significantly lower muscle tension than the control group immediately after the treatment could be explained by the relaxation response of the affected muscle as a direct and sustained pressure (the squeeze) was repeatedly applied on it [25]. The sustained pressure of massage might stimulate the Golgi tendon organs to relax the muscle's reflexive relaxation afterward [13].

4.4 Immediate effect on reducing pain intensity

The results demonstrated that pain intensity was significantly decreased after receiving either one of the treatments compared to the baseline. However, the inter-group comparisons revealed that the TTM using the squeeze technique provided better results on pain reduction than the control group. The pain reduction was still maintained throughout the three days of the follow-up period without any adverse effect in participants of both groups (Table 3). The mechanisms that reduced the pain intensity may be explained by the gate control theory as previously discussed [27]. Because the neural mechanism responds to sustained squeeze or pressure rapidly-within a few seconds-it is possible that the effects of three 20-sec rounds of TTM using the squeeze technique could release muscle tension and muscle pain immediately after the treatment. On the contrary, patients taking a non-steroidal anti-inflammatory drug usually need to wait for a few hours to feel a relief from the pain and stiffness (2-h half-life 58.9-79.6%) [7].

4.5 Limitation of the study

This study had a few limitations. Firstly, it lacked blinding the participants on the comparison groups. The researchers found that it was difficult to blind the patients because of the nature of non-pharmacological treatments. This factor makes it prone to bias because the participants might prefer one treatment over the other. Further studies should consider blinding the participants by a sham massage with a light touch to strengthen the

clinical trial methodology. Secondly, the three-day follow-up for assessment of short-term effects was based on a subjective measure using telephone calls and a verbal descriptive scale of perceived pain intensity. We could not ask the patients to come to the hospital for an objective assessment because most of them lived far away from the hospital. Without serious health problems, they would not come to the hospital for any objective evaluation or treatment.

5. Conclusion

The results of this study suggest that a single session of the TTM using squeeze technique (the combination of a sustained squeeze on the trapezius muscles and active range of motion during squeeze) could immediately increase the cervical range of motion and pressure pain threshold and decrease the pain intensity and muscle tension on patients with neck strain. Given the effectiveness of this therapy technique with some limitations, plus its simplicity to administer without side effects, it could be used as an adjunctive treatment for patients with neck strain. Further studies on its long-term impact is recommended.

6. Ethical approval

The trial was registered in the Thai Clinical Trial Registry (ID: TCTR20181009004). The research proposal was approved by the Khon Kaen University ethical committee (IRB00003418).

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8. References

[1] Fejer R, Kyvik KO, Hartvigsen J. The prevalence of neck pain in the world population: a systematic critical review of the literature. Eur Spine J. 2006;15:834-848.
[2] Misailidou V, Malliou P, Beneka A, Karagiannidis A, Godolias G. Assessment of patients with neck pain: a review of definitions, selection criteria, and measurement tools. J Chiropr Med. 2010;9:49-59.
[3] Ravichandran P, Ponni HK, Aseer AL. Effectiveness of ischemic compression on trapezius myofascial trigger points in neck pain. Int J Physiother. 2016;3(2):186-192.
[4] White K, Thomas H, Joseph T. Cervical sprain/strain definition. Dis Mon. 2009;55(2):724-728.
[5] Walter R, Julie K, Thomas D. Essentials of physical medicine and rehabilitation: musculoskeletal disorders, pain, and rehabilitation. 3rd ed. Philadelphia: Elsevier Saunders; 2002.
[6] Cheng Y, Huang G. Efficacy of massage therapy on pain and dysfunction in patients with neck pain: a systematic review and meta-analysis. Evid Based Complement Alternat Med. 2014:13-32.
[7] Qandil A. Prodrugs of non-steroidal anti-Inflammatory drugs (NSAIDs), More than meets the eye: a critical review. Int J Mol Sci. 2012;13(12):17244-17274.
[8] Yoopat P, Maes C, Poriau S, Vanwonterghem K. Thai traditional massage: efficiency-assessment of three traditional massage methods on office workers: an explorative study. J Bodyw Mov Ther. 2015;19(2):246-252.
[9] Cowen V, Burkett L, Bredimus J, Daniel E, Lamey S, Neuhauser T, et al. A comparative study of Thai massage and Swedish massage relative to physiological and psychological measures. J Bodyw Mov Ther. 2006;10(4):266-275.
[10] Tapanya S. Traditional Thai massage. 1st ed. Bangkok: Duang Kamol; 1993.
[11] Gemmell H, Miller P, Nordstrom H. Immediate effect of ischaemic compression and trigger point pressure release on neck pain and upper trapezius trigger points: a randomized controlled trial. C Chiropr. 2008;11(1):30-36.
[12] Eungpinichpong W, Kungnaka T. Effects of femoral artery temporarily occlusion on skin blood flow of foot. J Med Tech Phy Ther. 2002;14(2):151-159.
[13] Buttagat V, Eungpinichpong W, Chatchawan U, Kharmwan S. The immediate effects of traditional Thai massage on heart rate variability and stress-relate parameters in patients with back pain associated with myofascial trigger points. J Bodyw Mov Ther. 2011;15(1):15-23.
[14] Buttagat V, Eungpinichpong W, Chatchawan U, Arayawichanon P. Therapeutic effects of traditional Thai massage on pain, muscle tension and anxiety in patients with scapulocostal syndrome: a randomized single-blinded pilot study. J Bodyw Mov Ther. 2012;16(1):57-63.

[15] Buttagat V, Eungpinichpong W, Kaberd D P. Acute effects of traditional Thai massage on electroencephalogram in patients with scapulocostal syndrome, Chatchawan U, Arayawichanon. Complement Ther Med. 2012;20(4):167-174.
[16] Christopher A, James R, James W. A meta-analysis of massage therapy research. Psychol Bull. 2004;130(1):3-18.
[17] Eungpinichpong W. Therapeutic Thai massage. 1st ed. Bangkok; Chonromdek Publishing House; 2008.
[18] Rohrig B, Baptist JDP, Wachtlin D, Kwiecien R, Blettner M. Sample size calculation in clinical trials. Dtsch Arztebl Int. 2010;107(31-32):552-600.
[19] Panngooluem K, Eungpinichpong W. Reliability and validity of a "WE-CAP" device for measurement of cervical range of motion. J Med Tech Phy Ther. 2018;30(2):237-243.
[20] Audette I, Dumas JP, Julie N, Sophie J, Sophie J. Validity and between-day reliability of the cervical range of motion (CROM) device. J Orthop Sports Phys Ther. 2010;40(5):318-323
[21] Bijur P, wendy S, John G. Reliability of the visual analog scale for measurement of acute pain. Acad Emerg Med. 2001;8:1153-1157.
[22] Damapong P, Kanchanakhan N, Eungpinichpong W, Putthapitak P, Damapong P. A randomized controlled trial on the effectiveness of court-type traditional Thai massage versus amitriptyline in patients with chronic tension-type headache. Evid Based Complement Alternat Med. 2015;(5):930175.
[23] Ylinen J. Pressure algometry. Aust J Physiother. 2007;53(3):207.
[24] Starmer DJ, Duquette SA, Stainsby BE, Giuliano AM. The examination of soft tissue compliance in the thoracic region for the development of a spinal manipulation training mannequin. J Can Chiropr Assoc. 2015;59(2):150-156.
[25] Delaney JPA, Leong KS, Watkins A, Brodie D. The short-term effects of myofascial trigger point massage therapy on cardiac autonomic tone in healthy subjects. J Adv Nurs. 2002;37(4):364-371.
[26] Weerapong P, Patria A, Gregory S. The Mechanisms of Massage and effects on performance, muscle recovery and injury prevention. Sports Med. 2005;35(3):235-256.
[27] Field, T, Diego M, Hernandez R. Massage therapy research. Dev Rev. 2007;27(1):75-89.