



SINGLE CASE STUDY

# Massage therapy decreases frequency and intensity of symptoms related to temporomandibular joint syndrome in one case study

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## KEYWORDS

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tional release;  
Jaw pain;  
Headache;  
Trigger point (TrPT);  
Alternative therapy

## Summary

**Objective:** This study investigated the ability of massage therapy to mitigate the frequency and intensity of headaches, jaw clicking and masticatory pain associated with temporomandibular joint syndrome (TMJ).

**Methods:** The subject reported 3 years of masticatory pain, clicking, teeth grinding, reduced jaw opening and headaches prior to the study. A log was kept documenting frequency, intensity and type of pain. Pre- and post-treatment jaw opening was recorded. Western massage techniques combined with strain-counterstrain techniques targeted the upper torso, cervical region and oral cavity twice weekly for 30 min each over 3 weeks.

**Results:** TMJ-related pain decreased and maximal jaw opening increased by almost a third. Jaw clicking decreased fourfold to once monthly. Teeth grinding was unchanged.

**Conclusion:** The results suggest that western massage and strain-counterstrain techniques can improve jaw range of motion, alleviate the intensity and reduce the frequency of TMJ-related pain without surgical or pharmacological intervention.

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## Introduction

The intent of this study was to investigate the effectiveness of massage therapy combined with counterstrain positional release techniques in

alleviating the frequency and intensity of headaches, jaw clicking and masticatory pain associated with temporomandibular joint syndrome (TMJ).

Massage therapy has produced favorable results in the management of anxiety and stress (Field et al., 2005; Hanley et al., 2003), while massage therapy and counterstrain positional release have shown significant effectiveness in the reduction of

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myofascial pain related to back pain, headaches and fibromyalgia (Davies, 2004; Simons et al., 1999). Therefore, it is likely that the benefits of these techniques could extend to other myofascial pain conditions such as temporomandibular syndrome.

More than ten million Americans are affected by orofacial pain (National Institute of Dental and Craniofacial Research, 2006). It is particularly debilitating due to its impact on daily functions such as chewing and swallowing as well as our personal expression through talking and laughing. Temporomandibular disorders may be categorized as intracapsular or extracapsular. Intracapsular disorders include rheumatoid arthritis, osteoarthritis and articular disc displacements. Extracapsular disorders are collectively known as TMJ myofascial pain syndrome, TMJ dysfunction syndrome or simply TMJ syndrome. TMJ is the second most common cause of orofacial pain, affecting 10–12% of the general population, with 2–5% of the population having severe enough symptoms to warrant treatment (Sarlani et al., 2005).

TMJ is characterized by chronic or acute musculoskeletal or myofascial pain with dysfunction of the masticatory system. The pain may radiate to the ear, jaw and posterior cervical region. It is aggravated by movements of the jaw, and can feature tenderness upon joint and muscle palpation, limited mandibular range of motion, deviation or deflection of the mandible on opening as well as jaw sounds (Sarlani et al., 2005). In addition to facial and jaw pain, patients with chronic TMJ report headaches, dizziness, depression, poor sleep and low energy (Dixon et al., 2004; McNeely et al., 2006). Together these complaints represent a considerable burden on our healthcare system.

The etiology of TMJ is complex. Dysfunction may originate from a combination of factors including anxiety, stress and depression, trauma involving local tissues, spasm of the muscles of mastication, chronic malocclusion, repetitive chronic microtrauma (e.g. grinding/bruxism or clenching of teeth), unaccustomed jaw use (e.g. opening mouth wide for a long dental appointment), occlusal disharmony (Bell, 1982; De Laat, 1997; Sarlani et al., 2005), referred pain from neck and shoulder muscles (Davies, 2004; Sarlani et al., 2005; Simons et al., 1999), as well as sacral dysfunction (Upledger, 1987). According to De Laat (1997), “the etiological factors implied in muscle problems refer to more generalized disorders as myofascial pain syndrome and fibromyalgia. The role of occlusal and articular factors has been brought down to realistic proportions, indicating a minor contribution”. Emotional stress may be an essential

activating factor in otherwise dormant and non-symptomatic temporomandibular conditions (Bell, 1982).

Myofascial pain is characterized by the presence of highly irritable, localized, exquisitely tender nodules in a muscle called trigger points (TrPTs). TrPTs are typically found in taut muscle bands and produce a characteristic pain referral pattern on palpation. In the case of TMJ, masseter, pterygoids and temporalis muscles can refer pain to the posterior teeth and jaw, while the sternocleidomastoid and the trapezius muscles refer to the jaw or temple (Davies, 2004; Sarlani et al., 2005; Simons et al., 1999). Often the patient will be unaware of the TrPTs at the source, recognizing only the pain at its referral pattern. Due to interference with the biomechanics of the joint, a simple myofascial pain dysfunction may lead to internal derangement within the joint (Bell, 1982).

Despite muscle-related conditions accounting for 50% of temporomandibular joint disorders (Kapur et al., 2003), review of the literature indicates that research has been predominantly related to intracapsular disorders. Treatments discussed in these studies include bite plates to eliminate nocturnal clenching and bruxism, jaw exercises and stretching, application of vapocoolant sprays, ultrasound, high-voltage stimulators, injection of local anesthetic into TrPTs and various types of dental surgery. Pharmacological treatment includes use of NSAIDs, narcotics, muscle relaxants, antidepressants, anticonvulsants and corticosteroids (Kapur et al., 2003). Many of these traditional treatments are costly, invasive and involve negative side effects.

Studies regarding alternative TMJ therapies include acupuncture (List and Helkimo, 1991; McNeely et al., 2006; Rosted et al., 2006; Smith et al., 2006; Wang et al., 1998), chiropractic (Chinappi and Getzoff, 1995; DeVocht et al., 2003), physical therapy (Cleland and Palmer, 2004; Friedman, 1997; McNeely et al., 2006; Michelotti et al., 2005; Sturdivant and Friction, 2005), relaxation (Wahlund et al., 2003) and meditation (Masarsky, 1983), all of which report varying degrees of success and suggest further investigation. The most widely studied in this review appears to be acupuncture. In one study of 60 dental patients (Rosted et al., 2006) manual stimulation of acupuncture points over the temporomandibular joint and in the masticatory muscles, points on the neck and additional relaxing points was performed for 12 min an average of 3 sessions, with a beneficial effect in 85% and a 75% average reduction in pain intensity. Wang et al. (1998) improved mouth opening and eliminated pain in

93% of 477 cases using acupuncture to the He Gu and Min Yin points.

Although physical therapy often includes massage modalities along with exercises, the evidence regarding treatments is from clinical reports and tends to be anecdotal. A small-scale study was performed to develop a massage protocol for clinical trial (Dixon et al., 2004); however, the author noted that this study was related to feasibility of a study, not the efficacy of massage therapy as treatment for TMJA review of physical therapy interventions by McNeely et al. (2006) sites manual therapy, passive and active muscle stretching and range of motion as the most useful techniques for increasing oral openings and decreasing pain. In a study regarding the use of complementary and alternative medicine for TMJ (DeBar et al., 2003), 192 patients with TMJ were surveyed regarding the effectiveness of various alternative therapies. Of the therapies reported by the 62.5% of participants using alternative therapy, the most satisfactory treatment was massage therapy.

Massage therapy has been shown to stimulate parasympathetic activity, engaging the relaxation response, which in turn reduces stress and anxiety as measured by psychological, hormonal and autonomic indicators (Delaney et al., 2002; Field et al., 2005; Hanley et al., 2003). There is also evidence that massage therapy alleviates numerous musculoskeletal pain conditions involving myofascial TrPTs including back pain, headaches and fibromyalgia (Davies, 2004; Ramirez et al., 1989; Simons et al., 1999). Likewise, counterstrain positional release, a technique that reduces neuromuscular activity, has been shown an effective treatment for the release of myofascial tender points (Jones 1964). Therefore, the combined benefits of massage therapy techniques with counterstrain positional release may prove an effective alternative treatment for myofascial pain associated with TMJ syndrome.

## Methods

*Client profile:* A 22 year-old female officer in the US armed forces had been suffering from painful TMJ-related symptoms for 3 years, the onset coinciding with deployment to war. She suffered specifically from tightness and clicking primarily on the left side, reduced jaw opening, headaches, neck and shoulder pain averaging a 6 on a 1–10 scale as well as sleep disruption due to grinding. Upon her return home she was diagnosed with TMJ

by her dentist, and prescribed a molded mouth guard to protect her teeth from further damage during nighttime grinding. The dentist also recommended that she find a way to reduce her stress level. The subject was enrolled in the study in October 2005 and instructed to monitor symptoms and record frequency, quality and intensity of pain. She was instructed to continue using her mouth guard, but not to begin any new/additional treatment plan.

*Study overview:* The 6-week study consisted of baseline symptom recording during the first 3 weeks of the study, followed by 30-min massage twice weekly over the next 3 weeks. Three indicators were monitored in a log recorded daily: pain level on a 1–10 scale, quality of sleep and jaw function (e.g. clicking, waking in the night). Jaw opening was measured prior to treatment and compared with measurements subsequent to the treatment period.

The practitioner's session notes recorded subjective data related to the level of tension in the involved musculature as determined through palpation.

*Treatment plan:* A manual therapy protocol was developed incorporating classic western massage techniques with counterstrain techniques. Counterstrain positional release is a specific, non-traumatic, indirect technique that passively places the body in a position of greatest comfort, thereby relieving pain by reduction and arrest of inappropriate proprioceptor activity that maintains somatic dysfunction (Jones, 1964). The treatment protocol was designed and administered by a massage therapy student for submission to the Massage Therapy Foundation Student Case Study Contest and was overseen by the school research coordinator.

Treatment consisted of 30-min sessions with the specific goals of relaxation and TrPTs relief in the upper torso, head, neck and facial areas. A total of 6 sessions were conducted over 3 weeks with a minimum of 48h separating each treatment. Each session was divided into 4 separate components:

*Warm-up:* Consisted of 5 min of classic western massage (effluage, petrissage and friction) to the back, head and neck in a prone position. Stress is considered to be an exacerbating factor in TMJ; this initial phase was thus designed to relieve stress and promote overall muscle relaxation. This segment allowed the practitioner to assess muscle tension and identify specific areas of hypertonicity in which TrPTs were expected.

*Counterstrain positional release:* Performed supine for 15 min on TrPTs in the following muscles:

pectoralis major, pectoralis minor, SCM, scalenes, upper trapezius and levator scapulae. These muscles were scanned individually and TrPTs located via palpation and subject feedback regarding referral pain and/or reproduction of symptoms. Once TrPTs were located they were treated by passively moving the subject into a shortened position of each involved muscle (pectoralis major: internal rotation and horizontal adduction of the humerus; pectoralis minor: internal rotation of the humerus and depression of the scapula; SCM: contralateral rotation and lateral flexion of the neck; scalenes: lateral flexion of the neck; upper trapezius: lateral rotation and flexion of the humerus, elevation of the scapula; levator scapula: flexion of the humerus and elevation of the scapula). These positions were held for 90s, or until a release was felt by either the practitioner or the subject.

**Intra-oral massage:** This 5-min segment was performed with the therapist wearing latex gloves. The initial intake determined that no allergy or sensitivity to latex was present. The therapist relied heavily on subjective data from the client regarding reproduction of pain to locate TrPTs in the masseter (see Fig. 1), medial pterygoid and lateral pterygoid muscles (see Fig. 2). Circular friction and sustained compression techniques were performed until the therapist felt a softening occur and/or the client reported a reduction in pain/tenderness.

**Session closure:** Comprised of 5 min of effleurage, range of motion and passive stretching of the involved muscles and was performed in the supine position in order to facilitate full muscle relaxation

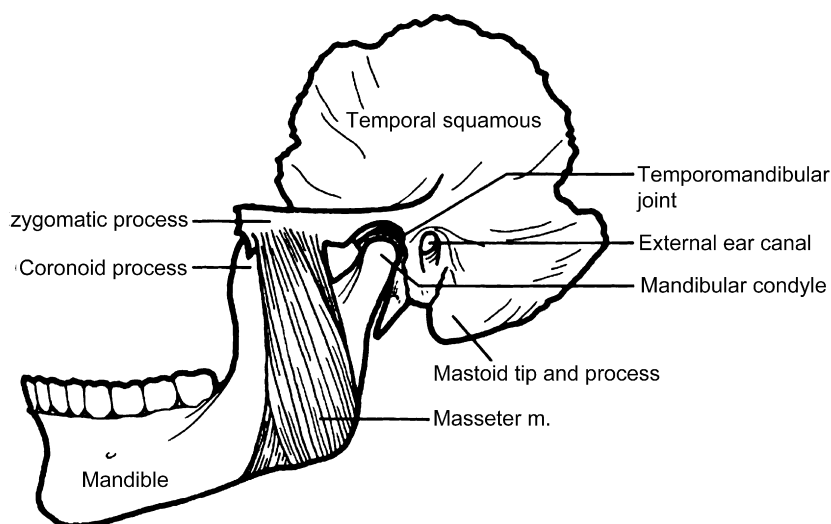
and acclimate the body to its newly acquired range of motion.

**Data analysis:** Data for jaw pain frequency are presented as the total number of occurrences per week. Pain intensity is presented as the mean  $\pm$  standard deviation (s.d.) each day over the baseline and compared to the treatment period. Jaw opening measurements were taken between the incisal edges of the upper and lower teeth at the most anterior aspect of the mouth.

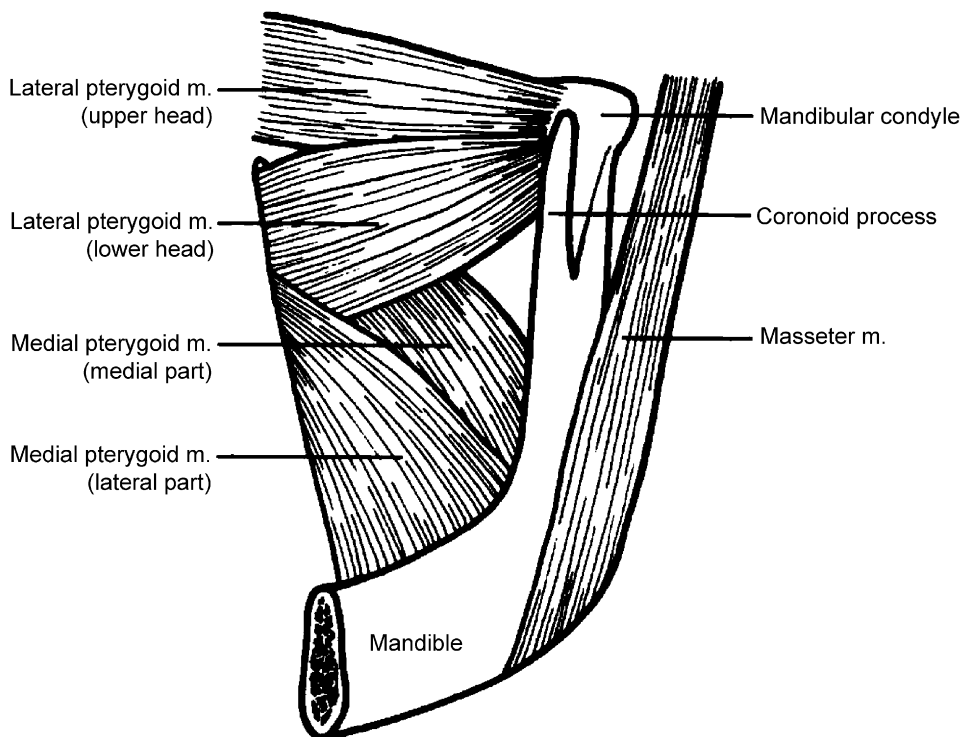
## Results

Primary TrPTs were located in the pectoralis major and minor, SCM, trapezius, levator, masseter and medial and lateral pterygoid muscles; these are consistent with expectations based on TMJ literature. Overall muscle tension levels (as indicated by presence of ropey bands, taught nodules or decreased elasticity) observed by the practitioner as well as localized tenderness and referral pain reported by the subject lessened in response to treatment during each session as well as across the span of the treatments.

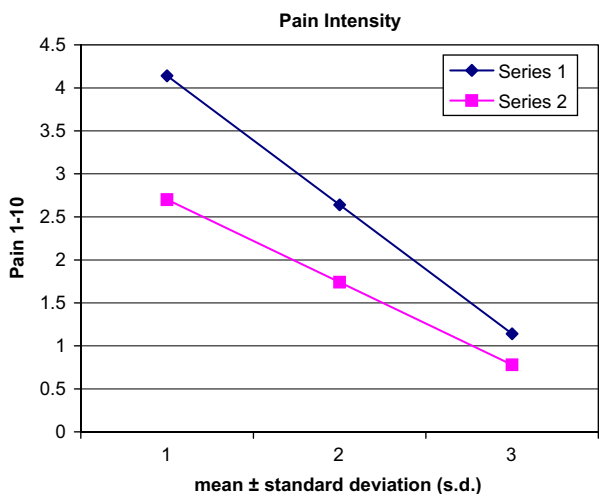
The intensity of jaw pain was recorded on a pain scale of 1–10 with 10 indicating the most severe pain. During the baseline period, the subject suffered TMJ-related pain at an average intensity of 2.64 with an s.d. of 1.50. She experienced clicking approximately once per week and woke to teeth grinding 0.5 times per week. While undergoing treatment, the pain level was reduced to an average of 1.74 with an s.d. of 0.96 (see Fig. 3).



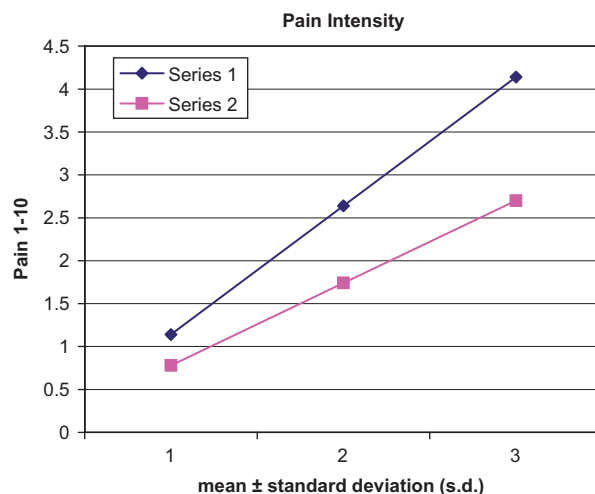
**Figure 1** Masseter muscle. The masseter was treated using a pincer grip (held 30s) with index finger inside the mouth and the thumb outside. Reproduced by kind permission by Eastman Press from *Craniosacral Therapy II: beyond the Dura* by Upledger (1987, p. 158).



**Figure 2** Medial and lateral pterygoid muscles. Intra-oral massage was applied to the bellies of the medial and lateral pterygoids, with index finger inserted into the subject’s relaxed mouth. Reproduced by kind permission by Eastman Press from *Craniosacral Therapy II: Beyond the Dura* by Upledger (1987, p. 176).



**Figure 3** Pain intensity. Pain intensity was recorded on a 1–10 pain scale. Series 1 illustrates the baseline period; Series 2 illustrates the treatment period.



**Figure 4** Series 1 represents baseline jaw opening measurement compared to normal range; Series 2 represents post-treatment jaw opening measurement compared to normal range.

Jaw clicking incidences were reduced to 0.25 per week, although waking to grinding was unchanged. Maximum jaw opening increased from 25 mm prior to treatment to 38 mm after the treatment period (see Fig. 4).

### Discussion

The results of this study suggest that the intensity and frequency of some jaw pain, as well as restricted range of motion related to TMJ, can be

alleviated via massage therapy. Reduction in pain and tension was noted immediately after the initial session, and improved range of motion was noted after the second session, suggesting that massage therapy offers nearly immediate relief from TMJ-related symptoms. On three occasions the subject reported pain levels between 3 and 4 prior to session, which were then reduced to 1–2 after treatment, lasting 1–3 days. This indicates massage as a potent strategy for intervention during an episode of extreme pain and/or tension. Throughout the treatment period, the practitioner noted a palpable reduction in the tension levels of the involved musculature. This observation was consistent with the measured results.

Although the post-treatment jaw opening measurement was still restricted in comparison with “normal” range of motion (42–55 mm), the increase was noteworthy with regards to improvement in the subject’s daily orofacial activities (e.g. talking, laughing, eating, etc.). Despite the lack of reduction in jaw grinding, which may be attributed to continued high levels of psychological stress in the subject’s life, the perception of significant reduction in pain intensity and enhancement in quality of life is reflected in the subject’s comments regarding treatment (see Fig. 5).

Despite the favorable results of this case study, it serves only as an introductory exploration of the effectiveness of soft tissue techniques in managing myofascial pain related to TMJ. There is a need for larger-scale studies to confirm these results. The subject was unavailable for follow-up to determine the lasting effects of treatment. Future studies should follow up at 3 and 6 months post-treatment to measure the same three indicators (pain level, clicking and jaw opening).

Vitamin inadequacy contributes to and increases the irritability of myofascial TrPTs due to interference with the energy supply to the muscles as well as augmented neural feedback mechanisms that perpetuate TrPTs (Simons et al., 1999). They wrote, “nearly half of the patients [we] see with chronic myofascial pain require resolution of vitamin inadequacies for lasting relief”. Nutritional

components would be a valuable element of further research, particularly with regard to lasting effects.

The current treatment protocol focused on relieving TrPTs via counterstrain positional release and sustained compression techniques. Further investigation into the role of TrPTs in causing myofascial pain related to TMJ is justified, as well as further investigation into the effectiveness of counterstrain positional release in releasing TrPTs.

The limitations of this study are inherent in the “case study” design, and are fundamental methodological issues commonly encountered in alternative therapy research (small sample group, lack of a control group and therefore lack of random assignment, and only one massage therapist preventing standardization of the protocol, Menard, 2002). Future research should be in the form of randomized controlled trials; however, this may be problematic due to the implementation of a standardized protocol by multiple therapists.

The therapeutic relationship plays a vital role in the effectiveness of the treatment, a factor which may be compromised when multiple therapists are involved. The treatment can vary drastically with the comfort level and rapport established in individual client/therapist relationships.

In addition to these limitations, the subject reported successfully using self-massage of the pterygoids and masseter between sessions to ease tension and soreness felt after a treatment. This variable was not monitored or recorded in this study, and may have influenced the results. The additional treatments must be considered with regards to treatment frequency in future studies. Further investigation is warranted to discover whether self-massage proves an effective solitary treatment. A large-scale randomized controlled trial might utilize three groups: one receiving the standardized protocol, one taught self-massage and a control group receiving no treatment.

If the results of this study are reinforced by future research, massage therapy would prove to be an extremely cost-effective, non-invasive solution for managing TMJ pain and preventing

<p>Session 1: “I can’t believe how loose my jaw feels!”</p> <p>Session 2: “My mouth was tender during treatment, now it feels great!”</p> <p>Session 3: “I can open my mouth so much farther without pain!”</p> <p>Session 4: “I haven’t woken up grinding my teeth in weeks!”</p> <p>Session 5: “The pain was a 3 or 4 before (the session), now the tension is gone!”</p> <p>Session 6: “The pain has been minimal..., I’m just looking forward to treatment.”</p>
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**Figure 5** Subject’s comments. The subject’s comments regarding treatment were recorded at each session.

muscle-related disorders from causing structural dysfunction within the joint.

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### Appendix A. Protocol

Thirty-minute sessions divided into 4 separate components:

- (I) Warm-up: 5 min.
  - (A) Prone position—back, head and neck.
    1. effluage,
    2. petrissage,
    3. friction.
- (II) Counterstrain positional release: 15 min.
  - (A) Supine position—positions held 90s.
    1. pectoralis major: internal rotation and horizontal adduction of the humerus,
    2. pectoralis minor: internal rotation of the humerus and depression of the scapula,
    3. SCM: contralateral rotation and lateral flexion of the neck,
    4. scalenes: lateral flexion of the neck,
    5. upper trapezius: lateral rotation and flexion of the humerus, elevation of the scapula,
    6. levator scapula: flexion of the humerus and elevation of the scapula.
- (III) Oral techniques: 5 min.
  - (A) Supine position—face.
    1. Circular friction and sustained compression intra-orally to the medial and lateral pterygoids.
    2. Sustained compression to the masseter with a pincer grip (held 30s).
- (IV) Session closure: 5 min.
  - (A) Supine position—face, neck, shoulders.
    1. effleurage,
    2. range of motion,
    3. passive stretching.

### Appendix B. Sample client log

Date	Pain scale 1–10	Waking to teeth grinding	Clicking occurrences
10/10	6	No	Yes
10/11	5	Yes	Yes
10/12	2	No	No

### References

Bell, W.E., 1982. *Clinical Management of Temporomandibular Disorders*. Year Book Medical Publishers, Inc., Chicago, pp. 128–140.

Chinappi, A.S., Getzoff, H., 1995. The dental–chiropractic cotreatment of structural disorders of the jaw and temporomandibular joint dysfunction. *Journal of Manipulative and Physiological Therapeutics* 18 (7), 476–481.

Cleland, J., Palmer, J., 2004. Effectiveness of manual physical therapy, therapeutic exercise, and patient education on bilateral disc displacement without reduction of the temporomandibular joint: a single-case design. *Journal of Orthopaedic and Sports Physical Therapy* 34 (9), 535–548.

Davies, C., 2004. *The TrP.Ts Therapy Workbook*, second ed. New Harbinger Publications, Oakland, pp. 50–74.

DeBar, L.L., Vuckovic, N., Schneider, J., Ritenbaugh, C., 2003. Use of complementary and alternative medicine for temporomandibular disorders. *Journal of Orofacial Pain* 17 (3), 224–236.

De Laet, 1997. Etiologic factors in temporomandibular joint disorders and pain. *Rev Belge Med Dent* 52 (4), 115–123.

Delaney, J.P., Leong, K.S., Watkins, A., Brodie, D., 2002. The short-term effects of myofascial TrP.Ts massage therapy on cardiac autonomic tone in healthy subjects. *Journal of Advanced Nursing* 37 (4), 364–371.

DeVocht, J.W., Schaeffer, W., Lawrence, D.J., 2003. Chiropractic treatment of temporomandibular disorders using the activator adjusting instrument and protocol. *Journal of Orofacial Pain* 17 (1), 42–49.

Dixon, M.W., Williams, L.A., Aickin, M., 2004. Developing a massage protocol for temporomandibular joint disorders. *Massage Therapy Journal* 43 (2), 109–115.

Field, T., Hernandez-Reif, M., Diego, M., Schanberg, S., Kuhn, C., 2005. Cortisol decreases and serotonin and dopamine increase following massage therapy. *International Journal of Neuroscience* 115 (10), 1397–1413.

Friedman, M.H., 1997. The hypomobile temporomandibular joint. *General Dentistry* 45 (3), 282–285.

Hanley, J., Stirling, P., Brown, C., 2003. Randomised controlled trial of therapeutic massage in the management of stress. *British Journal of General Practice* 53 (486), 20–25.

Jones, L.H., 1964. Spontaneous release by positioning. *The DO* 4, 109–116.

Kapur, N., Kamel, I.R., Herlich, A., 2003. Oral and craniofacial pain: diagnosis, pathophysiology, and treatment. *International Anesthesiology Clinics* 41 (3), 115–150.

List, T., Helkimo, M., 1991. Acupuncture in the treatment of patients with chronic facial pain and mandibular dysfunction. *Current Opinion in Dentistry* 1 (4), 485–496.

Masarsky, C.S., 1983. Structural implications of meditation: a review of principles and speculation of chiropractic applications.

- Journal of Manipulative and Physiological Therapeutics 6 (3), 143–145.
- McNeely, M.L., Armijo Olivo, S., Magee, D.J., 2006. A systematic review of the effectiveness of physical therapy interventions for temporomandibular disorders. *Physical Therapy* 86 (5), 710–725.
- Menard, M.B., 2002. *Methodological Issues in the Design and Conduct of Massage Therapy Research*. Mosby, New York, pp. 16–17.
- Michelotti, A., de Wijer, A., Steenks, M., Farella, M., 2005. Home-exercise regimes for the management of non-specific temporomandibular disorders. *Journal of Oral Rehabilitation* 32 (11), 779–785.
- National Institute of Dental and Craniofacial Research, 2006. TMJ disorders, NIH Publication No. 06-3487. Revised June 2006. Retrieved September 11, 2006. ([www.nidcr.nih.gov/HealthInformation/DiseasesAndConditions/TMDTMJ/TmjDisorders.htm](http://www.nidcr.nih.gov/HealthInformation/DiseasesAndConditions/TMDTMJ/TmjDisorders.htm)).
- Ramirez, M.A., Haman, J., Worth, L., 1989. Low back pain: diagnosis by six newly discovered sacral tenderpoints and treatment with counterstrain. *Journal of the American Osteopathic Association* 89 (7), 905–913.
- Rosted, et al., 2006. The use of acupuncture in the treatment of temporomandibular dysfunction—an audit. *Acupuncture in Medicine* 24 (1), 16–22 (abstract).
- Sarlani, E., Balciunas, B.A., Grace, E.G., 2005. Orofacial pain—part I: assessment and management of musculoskeletal and neuropathic causes. *AACN Clinical Issues* 16 (3), 333–337.
- Simons, D.G., Travell, J.G., Simons, L.S., 1999. *Travell & Simons' Myofascial Pain and Dysfunction: The TrPTs Manual*, second ed., vol. 1. Williams & Wilkins, Baltimore, pp. 186–189, 248–261.
- Smith, et al., 2006. The efficacy of acupuncture in the treatment of temporomandibular joint myofascial pain: a randomized controlled trial. *Journal of Dentistry* 35 (3), 259–267.
- Sturdivant, J., Friction, J.R., 2005. Physical therapy for temporomandibular disorders and orofacial pain. *Alternative Therapy Health Medicine* 11 (6), 70–73.
- Upledger, J.E., 1987. *Craniosacral Therapy II: Beyond the Dura*. Eastman Press, Seattle, pp. 151–207.
- Wang, et al., 1998. A study on the clinical curative effect by acupuncture for myofascial pain dysfunction syndrome. *Zhonghua Kou Yi Xue Za Zhi* 33 (5), 273–275 (abstract).
- Whalund, K., List, T., Larsson, B., 2003. Treatment of temporomandibular disorders among adolescents: a comparison between occlusal appliance, relaxation training, and brief information. *Acta Odontol Scand* 16 (4), 203–211.

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