<u>MASTERS SUBMISSION:</u> March, 2005

Student: Natalie Anderson

ID: 3519268

Intended submission as: Journal Article

Journal of choice: JOM (Journal of Osteopathic Medicine)

Article length: 3575 (Including front pages, references and appendix)

Instructions to authors for JOM: Attached.

RELEASE SIGNATURE:

PRINCIPAL INVESTIGATOR:

Mr.Cameron Gosling

Contact: 03 99191290

The Effect of a Specific Isometric Muscle Energy Technique on the Range of Opening of the Temporomandibular Joint

Natalie Anderson, Mr.Cameron Gosling
Osteopathic Medicine, School of Health Sciences, Victoria University, PO Box 14428 MCMC, Melbourne 8001, Australia

Student Number: 3519268

March 2005

This thesis is submitted in partial fulfilment of the requirements of the Degree: Masters Health Sciences (Osteopathy).

ABSTRACT

Objective: To determine whether a specific muscle energy technique had an effect on the vertical range of opening of the mandible of the TMJ compared to therapeutic jaw exercises and non-intervention control group.

Subjects: Twentyone (N=21) participants aged at least 18 years were recruited into the study via notices pinned up in the Victoria university teaching clinic.

Design: Participants were randomly allocated in to a group to receive an application of a specific isometric MET, a therapeutic jaw exercise or a non-intervention control group. Baseline measurements of jaw opening distance were obtained from the groups prior to the application of any therapy. All groups completed a temporomandibular dysfunction symptom checklist to determine the symptoms of temporomandibular joint dysfunction, immediately before the intervention 30 minutes after the application of the therapeutic jaw exercises and one week post intervention. A questionnaire to determine the patients' own perception of pain was administered prior to the intervention, immediately after, 30 minutes following and one week post intervention. In this study only the outcome on range of jaw opening is discussed.

Setting: Victoria University teaching clinic

Data analysis: Three separate ANOVAs were used for each variable (jaw opening, pain and symptom score) they were conducted to test for differences between the groups. Analysis of jaw opening utilized a 3 x 6 (group x time) ANOVA while pain and symptoms used 3 x 3 (group x time) ANOVAs. Significance was set at $P \leq 0.05$. A power analysis of previous research[1] has indicated a very large effect size (Cohen's $f = 1.3$) for jaw opening.

Results: The results of this study indicate that MET and therapeutic jaw exercises are useful techniques in improving TMJ range of opening ($P = 0.000$).

Conclusions: Within the limitations of the study, the results support the hypothesis that the application of a specific Osteopathic treatment, in this case MET and therapeutic jaw exercises can improve the range of opening in the TMJ. The results of this study provide a basis for further research as they present valuable outcomes for Osteopaths treating jaw dysfunction.

Key Indexing Terms: MET, temporomandibular dysfunction, osteopathic treatment, therapeutic jaw exercises.

INTRODUCTION

Temporomandibular dysfunction comprises a constellation of signs and symptoms including joint tenderness and pain on function, restricted jaw movement, clicking, jaw locking and tenderness in the muscles of mastication.[2] Hypertonicity of the primary muscles of mastication (temporalis, masseter, medial and lateral pterygoids), regardless of aetiology, may reduce the mobility of the temporomandibular joint (TMJ) resulting in a restricted range of mouth opening. This restriction is one of the signs of temporomandibular dysfunction, as is pain, locking, headaches and tinnitus. Studies have reported that as much as 75% of the general population will have some type of TMD[3] and it is estimated that more than 85 to 90% of people will display one or more of the TMD symptoms in their lifetime.[4,5,6]

The measurement of motion at the TMJ

Range of mouth opening measured using an inter-incisal or linear technique, involving the measurement of the distance between the incisal surface of a mandibular central incisor and the corresponding maxillary central incisor edge when the mouth is maximally opened, has been used extensively in research conducted by Carlson.[7] In previous research it had been determined that the measurement should include the amount of overlap between the upper and lower central incisors when in the occlusal position, plus the inter-incisally measured range of opening.[8-15] Because this study was an investigation of functional mouth opening ability the inter-incisal measure was the most appropriate measurement method. It is inexpensive, non-invasive, easy to use and applicable for use in general practice.[5] An inter-incisal distance of less than 40mm represents a restricted range of motion [8,9,11,12,16,17]while normal range of mandibular

opening is expected to be between 45 and 60mm for males, and 40 to 55mm for females.[10] Mandibular opening should be free of joint noise, smooth and without deviation.[8]

Treatment of TMD modalities

Surgical, dental, pharmacological and physical therapy modalities have all been used previously to treat TMD. Manual therapy, be it osteopathy, chiropractic or physiotherapy aims to relieve pain, restore function, and prevent recurrence of pain and dysfunction by reducing muscle spasm, inflammation, and regaining normal range of motion of at least 40mm of mandibular opening in people suffering TMD.[16-19] Manual therapy treatment protocols have included transcutaneous electrical nerve stimulation (TENS), microcurrent electrical nerve stimulation (MENS), moist/deep heat, vapocoolant sprays, ultrasound, cryotherapy, mobilization, therapeutic exercises, laser therapy, iotntophoresis, phonophoresis, electroacupuncture and biofeedback with varying degrees of success.[2,13,14,18,20-26]

Therapeutic Jaw Exercises

Muscle exercises are of great value in the treatment of TMD. Therapeutic manual therapy and exercises have yielded favourable results in the rehabilitation of TMD.[14,24,26] Stretching exercises are designed to increase the range of motion of the mandible. The purpose of exercises for the masticatory system are (1) to achieve relaxation of tense muscles, (2) to retain coordination and rhythmic muscle function, (3) to increase mandibular range of motion (isotonic exercises) (4) to increase muscular strength (isometric exercises). Such activity stimulates the muscle spindles and Golgi tendon organs reducing excessive activity. The principle is that when a muscle is actively

contracted, its antagonists are reflexly relaxed. Therefore opening the mouth against resistance tends to relax contracted elevator muscles and vice versa for opening muscles. The fact that physical therapy is non-invasive and does not appear to be fraught with irreversible changes makes it a very applicable vehicle in the area of clinical TMJ dysfunction management.[18,27]

Muscle Energy Technique

Muscle energy (MET) is a technique whereby the patient actively uses their muscles against a counterforce produced by the practitioner. The practitioner controls the intensity, timing and direction. According to Greenman[28], MET can be used to "lengthen a shortened, contracted or spastic muscle; to strengthen a physiologically weakened muscle or group of muscles; to reduce localized oedema and relieve passive congestion (the muscles are the pump of the lymphatic and venous systems); and to mobilize an articulation with restricted mobility".

They are used primarily by osteopaths to treat muscles with excessive tension that limit joint motion.[29,30] However, treatment of the TMJ using MET has not commonly been documented, although it may have a beneficial outcome on the limited range of motion frequently associated with TMD.[1] Malone[9] advocates the use of "hold – relax" techniques (similar to muscle energy technique) on the mandibular elevators (masseter, temporalis, and medial pterygoid) to improve functional mobility of the TMJ, and range of mouth

opening. MET treatment of the TMJ must be considered as a valid treatment approach for TMD if it can be shown to improve functional range.

The present study examines whether a specific muscle energy technique would have an effect on the vertical range of opening of the mandible, pain and dysfunction of the TMJ compared to therapeutic jaw exercises and non-intervention control group.

METHODS

Participants

Volunteer participants (N = 21) with a restricted mandibular range of motion of 40mm or less measured inter-incisally were recruited for the study. Symptomatic and asymptomatic participants (age:26.14 ±10.41 range = 19 – 58 years, , males = 7, females =14) were recruited from the student osteopathic teaching clinic at Victoria University. Volunteers were excluded if they had been previously diagnosed with a systemic arthropathy such as Rheumatoid Arthritis, or malignant tumours of the face or jaw; previous history of jaw or TMJ surgery or fracture; or have had dental/orthodontic treatment in the past seven days.[13,16] All volunteers signed informed consent prior to participating and the Victorian University Human Research Ethics Committee approved the study.

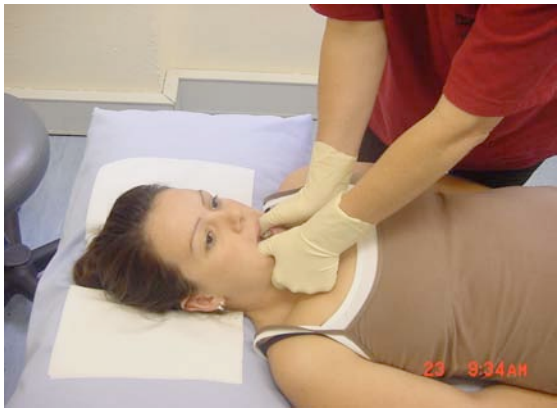
Procedure

Mandibular range of opening was measured inter-incisally, and not including the degree of overlap between the teeth when in the closed position. This involved a measurement being taken with a transparent ruler as the participant opened their mouth to the maximum possible distance. The distance between the edges of the upper central incisors, and the lower central incisors was determined as the inter-incisor range of opening.[7, 9, 11,16,17]

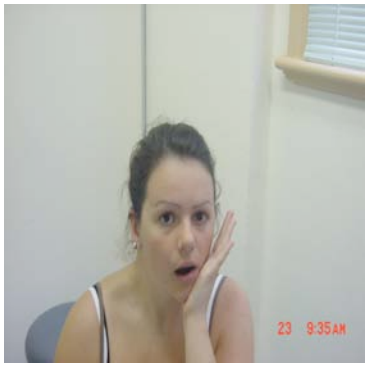
Measurements of jaw opening were made pre intervention, immediately after, 5 minutes, 10 minutes, 20 minutes, 30 minutes and one week after the application of the intervention

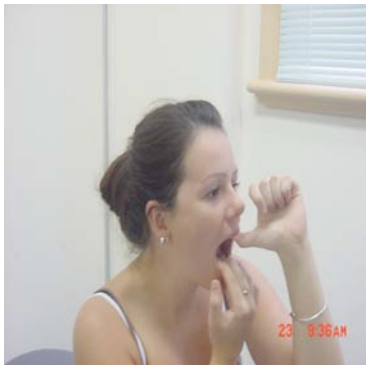
The participants were then allocated into three groups via randomised computer allocation, (i.e. group A – control group, group B –MET intervention group, group C – therapeutic jaw exercises) each with an equal number of participants. The control group did not receive any treatment.

The MET technique used in this study involved the treating practitioner placing gloved thumbs on the lower molars on both sides of the participant's jaw, whilst the participant lay supine with the mouth open. The participant was asked to attempt closing the jaw using 20% of their total effort as the practitioner provided an equal resistance with the thumbs, so that no movement occurred. The treating practitioner instructed the participant to ensure that the force of contraction was approximately 20% of their total effort and was not excessive or likely to cause pain or muscle soreness**.** After a five second contraction, the participant relaxed the jaw muscles, and then the practitioner gently opened the jaw to the maximal distance possible and the participant was again asked to attempt closing the jaw using 20% of their total effort. This contract-relax procedure was repeated five times.[1,29]



The therapeutic jaw exercises used in this study included stretching, guided opening and closing movements and manual opening of the jaw. At the start of the treatment period all participants were given a presentation and practical demonstration of the exercise programme by the treating practitioner. Patient used a clenched fist under the jaw to provide resistance to opening. With fingers holding lower teeth, patient resisted closing the mouth. Using a clenched fist held on the side of the jaw, the patient resisted side movement (lateral excursion). By placing the thumb on the top row of teeth and index finger on lower teeth the patient actively stretched the mouth open. All movements were held for a couple of seconds. All movements were repeated 10 times to complete one set. Five sets were required for each movement. This regime occurred once.[18,26]





The treating practitioner instructed the participant to ensure that the force of contraction was approximately 20% of their total effort and was not excessive or likely to cause pain or muscle soreness.

The non intervention group had measurements of jaw opening taken. Participants were asked do lie on a treatment table, in a comfortable position. Measurements of jaw opening were made again 5, 10, 20 and 30 minutes later. Measurements were taken one week post testing date. They received no therapeutic intervention. A measure to determine the patients own perception of pain was administered prior to the non intervention, immediately after, 30 minutes following and one week post intervention.

All treatments were performed in the student osteopathic clinic at Victoria University. All measurements were taken with the subject lying supine on the treatment table, while the investigator stood to the right hand side.

ANALYSIS OF DATA

All range of opening data is expressed as mean (M) ± standard deviation (SD). A split plot ANOVA was used to assess changes within and between groups and analysed using SPSS version 12.0. Further analysis to determine differences between groups at 30 minutes and 1 week post intervention was achieved by ANCOVA using pre-intervention scores as the covariate. Effect sizes for groups are reported as $\_^2$ and significance was set at $P \leq 0.05$.

RESULTS

All volunteers completed the treatment and no adverse events were reported for any of the interventions. There was no significant difference between groups for mean range of jaw opening pre test ($F = 0.545$ $P = 0.589$) although the MET group did have a mean score about 1 cm lower than the other two groups. Mean range of opening for all subjects pre intervention was 37.95 ± 3.06 cm. It was observed that there was a significant mean increase in jaw opening over time ($F=13.93$ $P=0.000$). This is highlighted in figure 1, which represents the range of jaw opening before and after the MET procedure, therapeutic jaw exercise and control.

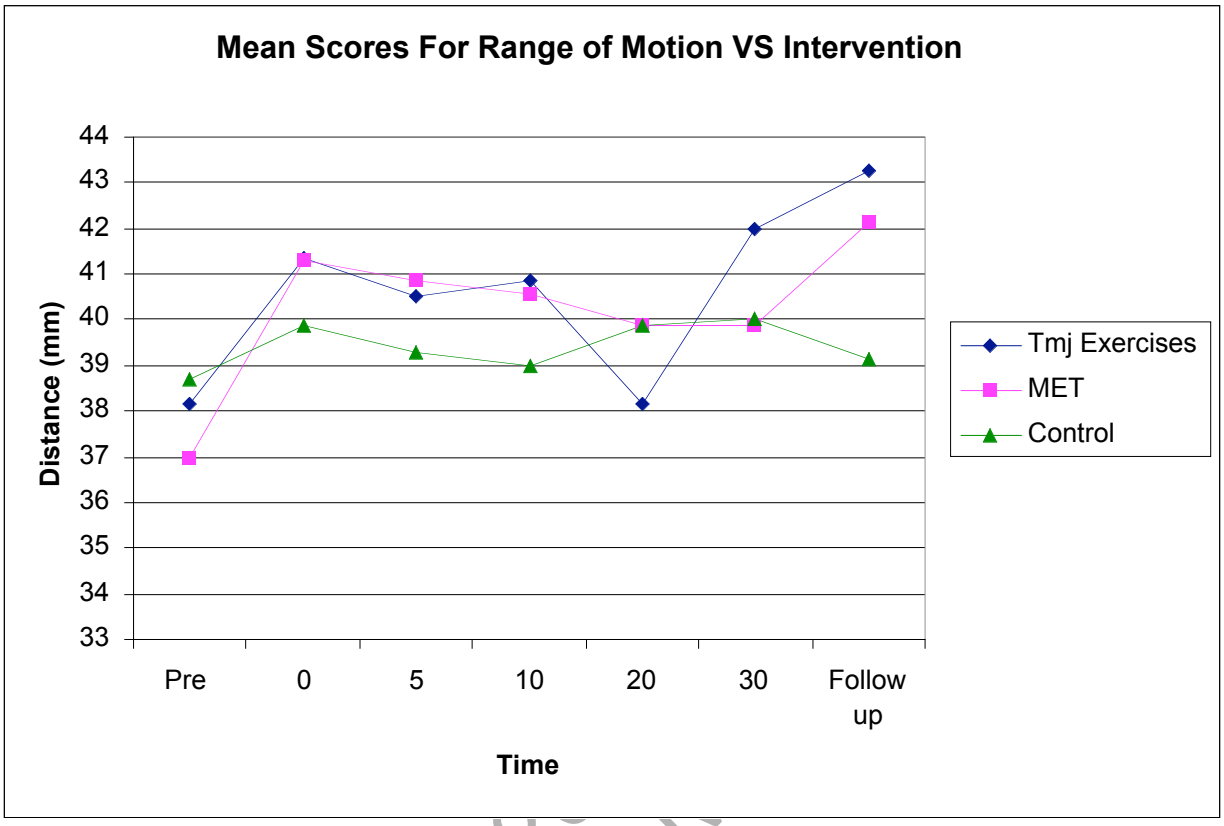


Figure 1.

The ANCOVA analysis demonstrated a significant difference between groups at 30 minutes (F = 3.611 P = 0.049) and one week (F = 16.188 P = 0.000) post intervention. Further Post Hoc analyses showed that for the 30 minute time interval the difference occurred between the therapeutic jaw exercises and control groups (P = 0.016) while at one week post intervention the difference occurred between the control and the therapeutic jaw exercise groups (P = 0.000) as well as the control and MET groups (P = 0.000). This is represented by a percentage of change between pre intervention and 30 minutes of 10.71% in the therapeutic jaw exercise group and a 7.72% change for the

MET group. The control group displayed a change of 3.32%. The percentage of change demonstrated at 7 days post intervention was 13.48% in the therapeutic jaw exercise group and 13.90% for the MET group. The control group showed a change of 1.11%. All percentage mean differences and standard mean deviations are reported in tables 1 and 2 below.

Table 1

Percentage change between pre intervention scores and 30 minutes post intervention

	mean % change	% standard deviation
THE	10.71	3.37
MET	7.72	3.90
Control	3.32	1.11

Table2

Percentage change between pre intervention scores and 7 days post intervention

	mean % change	% standard deviation
THE	13.48	36.85
MET	13.90	46.03
Control	1.11	24.63

DISCUSSION

The results of this study suggest that a specific isometric muscle energy technique to the muscles of mandibular elevation and the application of therapeutic jaw exercises can improve the range of jaw opening in persons with restricted jaw movement.

Immediately post intervention both TMJ and TJE groups had an increase in range of jaw opening of 4mm and 3mm respectively.

It is interesting to note that in the TJE group the range of motion actually decreased at the 20 minute interval. An explanation for this could be attributed to muscle fatigue and micro tearing of the muscles of mastication due to repetitive motion under load. This theory is supported by Pertes[18] and Magnusson.[26]

Both the MET group and the TJE group all had an increased range of motion sustained for 7 days post intervention of greater than 5mm. The control group also had an increase in range of motion immediately post intervention; this was sustained at the 20 and 30 minute intervals but was all but lost 7 days post. It is possible that an increase in range of motion is achieved by simply repeatedly opening the jaw. This is not as significant when compared to the interventions.

The present study measures range of motion of the TMJ using < 40 mm of opening as a guide to dysfunction. In contrast other studies have focused on pain or the completion of the temporomandibular dysfunction checklist as an indication of dysfunction or a combination of all three.[32]

Pain is the most common presenting complaint and the most difficult to evaluate it is an unpleasant sensory and emotional experience that is always subjective and therefore difficult to measure.[33,34] The assessment of temporomandibular dysfunction using a check list strongly involves subjective data making it difficult to obtain reliable results.[32]

In comparison measurement of the range of motion of the temporomandibular joint using a plastic ruler and the protocol described in text involves objective measurements demonstrated to be reliable.[16]

Physical therapy modalities aim to improve the range of opening to a liner measure greater than 40mm.[5,8] This was supported in the current study by an increased in jaw opening of 13.48% in the TMJ group and by 13.90% in the MET group over a seven day period. It is previously reported that a multi disciplinary approach to TMD is of the greatest benefit to the patient.[7,18,24,31]

CONCLUSION

This study shows that applications of either a specific MET for the muscles of the TMJ or specifically designed TJE produce an increase in range of motion in the TMJ. The MET application was ultimately mildly more effective being sustained 7 days post intervention however both seem to be useful in the treatment of TMD and should be practiced with

caution in the clinical setting until further studies demonstrate the clinical effectiveness of the combined use of these treatment modalities in both asymptomatic and symptomatic populations.

References:

1. Freshwater Z, Gosling C. The effect of a specific isometric muscle energy technique on range of opening of the temporomandibular joint: a pilot study. Abstract in the *Journal of Osteopathic Medicine*. 2003;(6):36.

2. Gray RJ, Quayle AA, Hall CA, Schofield MA. Physiotherapy in the treatment of temporomandibular joint disorders: a comparative study of four treatment methods. *British Dental Journal.* 1994;176:257-261.

3. Conti PC, Ferreira PM, Pegoraro LF, Conti JV, Salvador MC. A cross-sectional study of prevalence and etiology of signs and symptoms of temporomandibular disorders in high school and university students. *Journal of Orofacial Pain.* 1996;10(3):254-262.

4. Zarb GA, Carlsson GE, Sessle BJ, Mohl ND. In Zarb GA, Carlsson GE and Rugh JD (eds). *Clinical Management. Temporomandibular Joint and Masticatory Muscle disorders.* Copenhagen.1994:529-548.

5. Nicolakis P, Erdogmus B, Kopf A, Nicolakis M, Piehslinger E, Fialka-Moser V. Effectiveness of exercise therapy in patients with myofascial pain dysfunction syndrome. *Journal of Oral Rehabilitation*. 2002;29:362-368.

6. Dimitroulis G, Gremillion HA, Dolwick MF, Walter JH. Temporomandibular disorders 2.Non-surgical treatment. *Australian Dental Journal.* 1995;40(6):373-376.

7. Carlson C, Bertrand P, Ehrlich D, Maxwell A, Burton R. Physical self-regulation training for the management of temporamandibular disorders. *Journal of Orofacial Pain*. 2001;15(1):47-55.

8. Agerberg G. Maximal mandibular movements in young men and women. *Swedish Dental Journal.* 1974;67(2):81-100.

9. Malone T, McPoil T, Nitz A. *Orthopedic and sports physical therapy, 3rd ed*, Sydney, Mosby; 1997: 556-593.

10. Curl D. The visual range of motion scale: Analysis of mandibular gait in a chiropractic setting. *Journal of Manipulative and Physiological Therapeutics.* 1992;15(2): 115 – 122.

11. Friction J, Schiffman E. Reliability of a craniomandibular index. *Journal of Dental Research.* 1986;65(11): 1359 –1364.

12. Kropmans T, Dijkstra P, Stegenga B, Stewart R, deBont L. The smallest detectable difference in outcome variables related to painful restriction of the temporomandibular joint. *Journal of Dental Research.* 1999;78(3): 784 – 789.

13. Taylor K, Newton R, Personius W & Bush, F. Effects of interferential current stimulation for treatment of subjects with recurrent jaw pain. *Physical Therapy.* 1987; 67(3):346-350.

14. Waide F, Bade D, Lovasko J, Montana J. Clinical management of a patient following temporomandibular joint arthroscopy. *Physical Therapy.* 1992;72(5): 355 – 364.

15. Dijkstra P, De Bont L, Stegenga B, Boering G. Angle of mouth opening measurement: reliability of a technique for temporomandibular joint mobility assessment. *Journal of Oral Rehabilitation.* 1995; 22(4):263-268.

16. Austin B, Shupe S. The role of physical therapy in recovery after temporomandibular joint surgery. *Journal of Oral and Maxillofacial Surgery*. 1993; 51:495-498.

17. Kraus S. *TMJ disorders; management of the craniomandibular complex*, Melbourne, Churchill Livingstone; 1988.

18. Pertes R, Gross S. *Clinical Management of Temporomandibular Disorders and Orofacial Pain.* Chicago, Quintessence Publishing Co, Inc; 1995.

19. Dworkin SF, Huggins KH, LeResch L and co-workers. Epidemiology of signs and symptoms in temporomandinular disorders: clinical signs and symptoms in cases and controls. *Journal of the American Dental Association.* 1990; 120(3): 273-281.

20. Hukisson, E. Visual Analogue Scales. In: Melzack R, ed. *Pain Measurement and Assessment.* New York: Raven Press; 1983: 33-37.

21. Bolton J, Wilkinson R. Responsiveness of pain scales: A comparison of three pain intensity measures in chiropractic patients. *Journal of Manipulative and Physiological Therapies.* 1998;21(1): 1-7.

22. Anonymous. Examination, diagnosis and management of temporomandibular disorders. *Journal of the American Dental Association*, 1983;106:75.

23. DiFabio R. Physical therapy for patients with TMD: A descriptive study of treatment, disability, and health status. *Journal of Orofacial Pain.* 1998;12(2):124 –134.

24. Bell, W.E. *Temporomandibular Disorders: Classification, Diagnosis, Management.* 3rd ed. Baltimore: Year Book Medical Publishers; 2001.

25. Royder, J.O. Structural Influences in Temporomandibular Joint Pain and Dysfunction. *Journal of AOA.* 1981; 80(7): 460:467.

26. Magnusson T, Syren M. Theapeutic jaw exercises and interocclusal appliance therapy. *Swedish Dental Journal*. 1999; 23(1): 27-37.

27. Kirk-Ws J, Calabrese DK. Clinical evaluation of physical therapy in the management of internal derangement of temporomandibular joint. *Journal of Oral Maxillofacial Surgery.* 1989; 47:113.

28. Greenman PE. *Principles of Manual Medicine, second ed.,* Baltimore: Lippincott Williams & Wilkins Co.; 1996.

29. Chaitow L. *Muscle energy techniques.* Melbourne: Churchill Livingstone; 2001.

30. Rex LH. Muscle Energy Technique – An overview. *Athletic Therapy Today.*1996; November: 38 – 40.

31. Clark GT, Adachi NY, Doran MR. Physical therapy as an adjunct to temporomandibular disorders: a review. *Journal American Dietetic Association.* 1990;121:151-61.

32. Nicolakis P, Erdogmus B, Kopf A, Djaber-Ansari A, Piehslinger E, Fialka-Moser V. Exercise Therapy for Craniomandibular Disorders. *Archives of Physical Medicine and Rehabilitation*. 2000; 81:1137-1142.

33. Dimitroulis G, Temporomandibular Disorders:a clinical update. *British Medical Journal.* 1998; 317:190-194.

34. Bolton J, Responsiveness of Pain Scales: A Comparison of Three Pain Intensity Measures in Chiropractic Patients. *Journal of Manipulative and Physiological Therapeutics*. 1998; 21(1):1-7.

Attachment A

Victoria University

INFORMATION TO PARTICIPANTS:

PROJECT TITLE

"The effect of a specific isometric muscle energy technique on the range of opening of the temporomandibular (jaw) joint: a control study".

INVESTIGATORS

PURPOSE AND PLAN OF THE STUDY

This study aims to investigate an osteopathic technique, called muscle energy, in the treatment of restricted jaw movement and pain. If you agree to participate in this study, you will be tested for a limited range of opening of the jaw. This involves opening the mouth and having the distance between the upper and lower teeth measured with a plastic ruler (inter-incisal measurement). If you are found to have less than or equal to 40mm of opening you will be asked to complete a temporomandibular symptom checklist regarding any jaw symptoms you may be experiencing, and a diagram that indicates the level of pain you have in the jaw, called a visual analogue pain scale.

The investigator will demonstrate and teach you how to participate in a muscle energy technique. Wearing gloves, the treating practitioner will place her thumbs along the lower molars on each side of the jaw, and gently open the mouth to the maximal opening distance available. You will be instructed to attempt to close the jaw using only an approximate 20% of your total effort possible. Contractions will be held for five seconds after which time the practitioner will tell you to relax the jaw, and will then gently open the mouth further to the maximal distance available. This contract relax procedure will be repeated a total of five times. **The treating practitioner will instruct the participant to ensure that the force of contraction is approximately 20% of their total effort and is not excessive or likely to cause pain or muscle soreness.**

Following the muscle energy treatment, another measurement of jaw opening will be taken. You will be asked to complete a second visual analogue pain scale. More measurements of jaw opening distance will be taken five minutes, ten minutes, twenty minutes and thirty minutes following the muscle energy technique. After thirty minutes, a second temporomandibular symptom checklist and a third visual analogue pain scale will be completed. The whole procedure will take approximately 45 minutes.

All temporomandibular symptom checklists, pain scales and measurement recordings, will be numerically coded to ensure your confidentiality is maintained. Only the investigators will have access to this information.

POTENTIAL RISKS AND SAFETY.

1. Some temporary discomfort may be experienced in the jaw or muscles surrounding the jaw during the muscle energy technique as a result of muscle contraction and / or stretch. All participants are instructed to raise their hand if they would like the procedure to stop in order to provide verbal feedback. The technique can then be adjusted to reduce any discomfort, or stopped if the participant so wishes.

2. It is possible that participants who have previously suffered from locking of the jaw in either an open or closed position may experience a temporary locking of the jaw. In the case of a lock of the jaw, a registered osteopath will apply soft tissue treatment and will gently ease the jaw back to a normal position. Appropriate medical care will be sought if necessary.

3. Some participants may have psychological issues associated with manipulative techniques in which the practitioner's hands are placed in the mouth. Such participants can choose not to be involved in the study.

4. The risk of infection transmission between patients has been considered, and is highly unlikely as the treating practitioner will be using a new pair of gloves for every participant.

POTENTIAL BENEFITS TO PARTICIPANTS AND OSTEOPATHS.

There is little documented evidence for the use of muscle energy techniques in the treatment of jaw movement restriction, and pain. This study will investigate the efficacy of such procedures. It has potential benefits to sufferers of jaw problems, as it will assist in the discovery of the optimal management of jaw complaints, to provide the best results for the osteopath's patients. The research will be useful to the osteopathic community, providing a starting point for the validation of muscle energy techniques for the jaw. It will help osteopaths to find the most effective treatment of jaw complaints. The findings of this study will be a base for further work into this area, helping osteopaths to substantiate their means of treatment.

VOLUNTARY PARTICIPATION

Your participation in this study is entirely voluntary. You are free to withdraw from the study at any time, for any reason.

CONFIDENTIALITY

All temporomandibular dysfunction symptom checklists, pain scales, and measurements will be numerically coded, and will only be accessible to the investigators, ensuring confidentiality is maintained.

QUESTIONS

You are free to ask questions or discuss any issues that may arise, at any time throughout the study. All questions should be directed to either:

If you have any questions regarding ethical issues, or issues regarding your rights, please contact the Secretary of the Human Research Ethics Committee, Victoria University of Technology, PO Box 14428 MCMC, Melbourne, 8001. (Phone: 9688 4710).

ATTACHMENT B

Victoria University of Technology
Consent Form for Subjects Involved in Research

INFORMATION TO PARTICIPANTS:
We would like to invite you to be a part of a study into the effect of specific muscle energy techniques on the vertical range of opening of the mandible, pain and dysfunction of the TMJ compared to therapeutic jaw exercises and non-intervention control group.

CERTIFICATION BY SUBJECT

I,
of, (address)

certify that I am at least 18 years old* and that I am voluntarily giving my consent to participate in the study entitled: The effect of a specific isometric muscle energy technique on the range of opening, pain and dysfunction of the temporomandibular joint. A control study being conducted at Victoria University of Technology by:

I certify that the objectives of the study, together with any risks and safeguards associated with the procedures listed hereunder to be carried out in the research, have been fully explained to me by:

and that I freely consent to participation involving the use on me of these procedures.

Procedures:
The participant will have the opening range of their jaw measured, followed by completion of a jaw dysfunction checklist and a diagram that indicates the level of pain at present. This will be followed by treatment with a technique (MET, therapeutic jaw exercise or no treatment).

The following potential risks have been explained to me:

- Some temporary discomfort may be experienced in the jaw or muscles surrounding the jaw during the muscle energy technique as a result of muscle contraction and / or stretch.
- It is possible that if I have previously suffered from locking of the jaw in either an open or closed position, I may experience a temporary locking of the jaw.
- I may have psychological issues associated with manipulative techniques in which the practitioner's hands are placed in the mouth, in which case I can inform the investigators or chose to withdraw from the study.
- The risk of infection transmission between patients has been considered, and is highly unlikely as the practitioner will be using a new pair of gloves for every participant.

certify that I have had the opportunity to have any questions answered and that I understand that I can withdraw from this study at any time and that this withdrawal will not jeopardise me in any way.

have been informed that the information I provide will be kept confidential.

igned: ..... }

Witness other than the researcher: } **Date:** .....

.....}

ny queries about your participation in this project may be directed to the researcher (Name). If you ave any queries or complaints about the way you have been treated, you may contact the Secretary, niversity Human Research Ethics Committee, Victoria University of Technology, PO Box 14428 MC, Melbourne, 8001 (telephone no: 03-9688 4710).

General Linear Model

Warnings

Box's Test of Equality of Covariance Matrices is not computed because there are fewer than two nonsingular cell covariance matrices.

Within-Subjects Factors

Measure: MEASURE_1

time	Dependent Variable
1	ROMPre
2	ROM0
3	ROM5
4	ROM10
5	ROM20
6	ROM30
7	ROM1wk

Between-Subjects Factors

		Value Label	N
Group	1.00	Ex	7
	2.00	MET	7
	3.00	Control	7

Descriptive Statistics

	Group	Mean	Std. Deviation	N
ROMPre	Ex	38.1429	3.67099	7
	MET	37.0000	3.69685	7
	Control	38.7143	1.49603	7
	Total	37.9524	3.05739	21
ROM0	Ex	41.4286	3.82349	7
	MET	41.2857	3.68394	7
	Control	39.8571	2.03540	7
	Total	40.8571	3.19821	21
ROM5	Ex	41.0000	3.82971	7
	MET	40.8571	6.76827	7
	Control	39.2857	1.79947	7
	Total	40.3810	4.44383	21
ROM10	Ex	41.1429	3.89138	7
	MET	40.5714	5.31843	7
	Control	39.0000	1.91485	7
	Total	40.2381	3.87175	21
ROM20	Ex	38.7143	4.68025	7
	MET	39.8571	4.94734	7
	Control	39.8571	2.91139	7
	Total	39.4762	4.09413	21
ROM30	Ex	42.1429	3.48466	7
	MET	39.8571	4.48808	7
	Control	40.0000	3.16228	7
	Total	40.6667	3.71932	21
ROM1wk	Ex	43.2857	5.02375	7
	MET	42.1429	5.39841	7
	Control	39.1429	1.86445	7
	Total	41.5238	4.53452	21

Multivariate Tests[d]

Effect		Value	F	Hypothesis df	Error df	Sig.
time	Pillai's Trace	.865	13.925[b]	6.000	13.000	.000
	Wilks' Lambda	.135	13.925[b]	6.000	13.000	.000
	Hotelling's Trace	6.427	13.925[b]	6.000	13.000	.000
	Roy's Largest Root	6.427	13.925[b]	6.000	13.000	.000
time * Group	Pillai's Trace	1.157	3.200	12.000	28.000	.005
	Wilks' Lambda	.158	3.287[b]	12.000	26.000	.005
	Hotelling's Trace	3.342	3.342	12.000	24.000	.006
	Roy's Largest Root	2.566	5.987[c]	6.000	14.000	.003

Multivariate Tests[d]

Effect		Partial Eta Squared	Noncent. Parameter	Observed Power[a]
time	Pillai's Trace	.865	83.552	1.000
	Wilks' Lambda	.865	83.552	1.000
	Hotelling's Trace	.865	83.552	1.000
	Roy's Largest Root	.865	83.552	1.000
time * Group	Pillai's Trace	.578	38.401	.961
	Wilks' Lambda	.603	39.439	.962
	Hotelling's Trace	.626	40.108	.959
	Roy's Largest Root	.720	35.922	.970

a. Computed using alpha = .05

b. Exact statistic

c. The statistic is an upper bound on F that yields a lower bound on the significance level.

d.
Design: Intercept+Group
Within Subjects Design: time

Mauchly's Test of Sphericity[b]

Measure: MEASURE_1

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.
time	.054	46.017	20	.001

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.

Mauchly's Test of Sphericity[b]

Measure: MEASURE_1

Within Subjects Effect	Epsilon[a]		
	Greenhouse -Geisser	Huynh-Feldt	Lower-bound
time	.552	.766	.167

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.

a. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

b.
Design: Intercept+Group
Within Subjects Design: time

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
time	Sphericity Assumed	167.973	6	27.995	8.052	.000
	Greenhouse-Geisser	167.973	3.311	50.730	8.052	.000
	Huynh-Feldt	167.973	4.598	36.535	8.052	.000
	Lower-bound	167.973	1.000	167.973	8.052	.011
time * Group	Sphericity Assumed	93.946	12	7.829	2.252	.014
	Greenhouse-Geisser	93.946	6.622	14.186	2.252	.045
	Huynh-Feldt	93.946	9.195	10.217	2.252	.025
	Lower-bound	93.946	2.000	46.973	2.252	.134
Error(time)	Sphericity Assumed	375.510	108	3.477		
	Greenhouse-Geisser	375.510	59.600	6.300		
	Huynh-Feldt	375.510	82.757	4.538		
	Lower-bound	375.510	18.000	20.862		

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Partial Eta Squared	Noncent. Parameter	Observed Power[a]
time	Sphericity Assumed	.309	48.310	1.000
	Greenhouse-Geisser	.309	26.660	.992
	Huynh-Feldt	.309	37.019	.999
	Lower-bound	.309	8.052	.765
time * Group	Sphericity Assumed	.200	27.020	.937
	Greenhouse-Geisser	.200	14.911	.774
	Huynh-Feldt	.200	20.704	.876
	Lower-bound	.200	4.503	.398
Error(time)	Sphericity Assumed			
	Greenhouse-Geisser			
	Huynh-Feldt			
	Lower-bound			

a. Computed using alpha = .05

Tests of Within-Subjects Contrasts

Measure: MEASURE_1

Source	time	Type III Sum of Squares	df	Mean Square	F	Sig.
time	Linear	66.673	1	66.673	22.488	.000
	Quadratic	2.469	1	2.469	.393	.539
	Cubic	76.222	1	76.222	15.574	.001
	Order 4	16.357	1	16.357	5.134	.036
	Order 5	.009	1	.009	.005	.945
	Order 6	6.241	1	6.241	3.650	.072
time * Group	Linear	21.031	2	10.515	3.547	.050
	Quadratic	6.269	2	3.134	.499	.615
	Cubic	43.349	2	21.675	4.429	.027
	Order 4	1.474	2	.737	.231	.796
	Order 5	10.430	2	5.215	2.860	.083
	Order 6	11.394	2	5.697	3.332	.059
Error(time)	Linear	53.367	18	2.965		
	Quadratic	113.095	18	6.283		
	Cubic	88.095	18	4.894		
	Order 4	57.351	18	3.186		
	Order 5	32.823	18	1.824		
	Order 6	30.779	18	1.710		

Tests of Within-Subjects Contrasts

Measure: MEASURE_1

Source	time	Partial Eta Squared	Noncent. Parameter	Observed Power[a]
time	Linear	.555	22.488	.994
	Quadratic	.021	.393	.091
	Cubic	.464	15.574	.961
	Order 4	.222	5.134	.573
	Order 5	.000	.005	.051
	Order 6	.169	3.650	.440
time * Group	Linear	.283	7.093	.583
	Quadratic	.053	.998	.119
	Cubic	.330	8.857	.686
	Order 4	.025	.463	.081
	Order 5	.241	5.720	.490
	Order 6	.270	6.663	.555
Error(time)	Linear			
	Quadratic			
	Cubic			
	Order 4			
	Order 5			
	Order 6			

a. Computed using alpha = .05

Levene's Test of Equality of Error Variances[a]

	F	df1	df2	Sig.
ROMPre	1.330	2	18	.289
ROM0	.242	2	18	.788
ROM5	1.113	2	18	.350
ROM10	.794	2	18	.467
ROM20	.864	2	18	.438
ROM30	.391	2	18	.682
ROM1wk	1.570	2	18	.235

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a
Design: Intercept+Group
Within Subjects Design: time

Tests of Between-Subjects Effects

Measure: MEASURE_1
Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Intercept	237043.599	1	237043.599	2684.133	.000	.993
Group	50.340	2	25.170	.285	.755	.031
Error	1589.633	18	88.313			

Tests of Between-Subjects Effects

Measure: MEASURE_1
Transformed Variable: Average

Source	Noncent. Parameter	Observed Power[a]
Intercept	2684.133	1.000
Group	.570	.088
Error		

a. Computed using alpha = .05

Post Hoc Tests

Group

Multiple Comparisons

Measure: MEASURE_1
Tukey HSD

(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Ex	MET	.6122	1.89858	.944	-4.2332	5.4577
	Control	1.4286	1.89858	.736	-3.4169	6.2741
MET	Ex	-.6122	1.89858	.944	-5.4577	4.2332
	Control	.8163	1.89858	.904	-4.0292	5.6618
Control	Ex	-1.4286	1.89858	.736	-6.2741	3.4169
	MET	-.8163	1.89858	.904	-5.6618	4.0292

Based on observed means.

Homogeneous Subsets

MEASURE_1

Tukey HSD[a,b,c]

Group	N	Subset 1
Control	7	39.4082
MET	7	40.2245
Ex	7	40.8367
Sig.		.736

Means for groups in homogeneous subsets are displayed.
Based on Type III Sum of Squares
The error term is Mean Square(Error) = 12.616.

a. Uses Harmonic Mean Sample Size = 7.000.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

c. Alpha = .05.

Oneway

Descriptives

ROMPre

		N	Mean	Std. Deviation	Std. Error
Ex		7	38.1429	3.67099	1.38750
MET		7	37.0000	3.69685	1.39728
Control		7	38.7143	1.49603	.56544
Total		21	37.9524	3.05739	.66718
Model	Fixed Effects			3.12948	.68291
	Random Effects				.68291[a]

Descriptives

ROMPre

		95% Confidence Interval for Mean		Minimum	Maximum	Between-Component Variance
		Lower Bound	Upper Bound			
Ex		34.7478	41.5380	30.00	40.00	
MET		33.5810	40.4190	30.00	40.00	
Control		37.3307	40.0979	36.00	40.00	
Total		36.5607	39.3441	30.00	40.00	
Model	Fixed Effects	36.5176	39.3871			
	Random Effects	35.0141[a]	40.8907[a]			-.63719

a. Warning: Between-component variance is negative. It was replaced by 0.0 in computing this random effects measure.

Test of Homogeneity of Variances

ROMPre

Levene Statistic	df1	df2	Sig.
1.330	2	18	.289

ANOVA

ROMPre

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	10.667	2	5.333	.545	.589
Within Groups	176.286	18	9.794		
Total	186.952	20			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: ROMPre
Tukey HSD

(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Ex	MET	1.14286	1.67278	.776	-3.1263	5.4121
	Control	-.57143	1.67278	.938	-4.8406	3.6978
MET	Ex	-1.14286	1.67278	.776	-5.4121	3.1263
	Control	-1.71429	1.67278	.571	-5.9835	2.5549
Control	Ex	.57143	1.67278	.938	-3.6978	4.8406
	MET	1.71429	1.67278	.571	-2.5549	5.9835

Homogeneous Subsets

ROMPre

Tukey HSD[a]

Group	N	Subset for alpha = .05
		1
MET	7	37.0000
Ex	7	38.1429
Control	7	38.7143
Sig.		.571

Means for groups in homogeneous subsets are displayed.
a. Uses Harmonic Mean Sample Size = 7.000.

Univariate Analysis of Variance

Between-Subjects Factors

		Value Label	N
Group	1.00	Ex	7
	2.00	MET	7
	3.00	Control	7

Descriptive Statistics

Dependent Variable: ROM0

Group	Mean	Std. Deviation	N
Ex	41.4286	3.82349	7
MET	41.2857	3.68394	7
Control	39.8571	2.03540	7
Total	40.8571	3.19821	21

Levene's Test of Equality of Error Variances[a]

Dependent Variable: ROM0

F	df1	df2	Sig.
1.602	2	18	.229

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Design: Intercept+ROMPre+Group

Tests of Between-Subjects Effects

Dependent Variable: ROM0

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	66.490[b]	3	22.163	2.729	.076	.325
Intercept	46.183	1	46.183	5.686	.029	.251
ROMPre	55.919	1	55.919	6.884	.018	.288
Group	21.357	2	10.678	1.315	.295	.134
Error	138.081	17	8.122			
Total	35260.000	21				
Corrected Total	204.571	20				

Tests of Between-Subjects Effects

Dependent Variable: ROM0

Source	Noncent. Parameter	Observed Power[a]
Corrected Model	8.186	.556
Intercept	5.686	.614
ROMPre	6.884	.696
Group	2.629	.245
Error		
Total		
Corrected Total		

a. Computed using alpha = .05

b. R Squared = .325 (Adjusted R Squared = .206)

Estimated Marginal Means

Group

Estimates

Dependent Variable: ROM0

Group	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Ex	41.321[a]	1.078	39.047	43.596
MET	41.822[a]	1.096	39.509	44.135
Control	39.428[a]	1.090	37.129	41.727

a. Covariates appearing in the model are evaluated at the following values: ROMPre = 37.9524

Pairwise Comparisons

Dependent Variable: ROM0

(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.[a]	95% Confidence Interval for Difference[a]	
					Lower Bound	Upper Bound
Ex	MET	-.501	1.543	.749	-3.756	2.755
	Control	1.893	1.528	.232	-1.331	5.118
MET	Ex	.501	1.543	.749	-2.755	3.756
	Control	2.394	1.567	.145	-.912	5.701
Control	Ex	-1.893	1.528	.232	-5.118	1.331
	MET	-2.394	1.567	.145	-5.701	.912

Based on estimated marginal means

a. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments)

Univariate Tests

Dependent Variable: ROM0

	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Contrast	21.357	2	10.678	1.315	.295	.134
Error	138.081	17	8.122			

The F tests the effect of Group. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

Univariate Tests

Dependent Variable: ROM0

	Noncent. Parameter	Observed Power[a]
Contrast	2.629	.245
Error		

The F tests the effect of Group. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

a. Computed using alpha = .05

Univariate Analysis of Variance

Between-Subjects Factors

		Value Label	N
Group	1.00	Ex	7
	2.00	MET	7
	3.00	Control	7

Descriptive Statistics

Dependent Variable: ROM30

Group	Mean	Std. Deviation	N
Ex	42.1429	3.48466	7
MET	39.8571	4.48808	7
Control	40.0000	3.16228	7
Total	40.6667	3.71932	21

Levene's Test of Equality of Error Variances[a]

Dependent Variable: ROM30

F	df1	df2	Sig.
.116	2	18	.891

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Design: Intercept+ROMPre+Group

Tests of Between-Subjects Effects

Dependent Variable: ROM30

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	214.706[b]	3	71.569	19.636	.000	.776
Intercept	143	1	.143	.039	.845	.002
ROMPre	191.754	1	191.754	52.611	.000	.756
Group	26.322	2	13.161	3.611	.049	.298
Error	61.961	17	3.645			
Total	35006.000	21				
Corrected Total	276.667	20				

Tests of Between-Subjects Effects

Dependent Variable: ROM30

Source	Noncent. Parameter	Observed Power[a]
Corrected Model	58.909	1.000
Intercept	.039	.054
ROMPre	52.611	1.000
Group	7.222	.587
Error		
Total		
Corrected Total		

a. Computed using alpha = .05

b. R Squared = .776 (Adjusted R Squared = .737)

Estimated Marginal Means

Group

Estimates

Dependent Variable: ROM30

Group	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Ex	41.944[a]	.722	40.421	43.468
MET	40.850[a]	.734	39.301	42.400
Control	39.205[a]	.730	37.666	40.745

a. Covariates appearing in the model are evaluated at the following values: ROMPre = 37.9524

Pairwise Comparisons

Dependent Variable: ROM30

(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.[a]	95% Confidence Interval for Difference[a]	
					Lower Bound	Upper Bound
Ex	MET	1.094	1.034	.305	-1.087	3.275
	Control	2.739*	1.024	.016	.579	4.899
MET	Ex	-1.094	1.034	.305	-3.275	1.087
	Control	1.645	1.050	.136	-.570	3.860
Control	Ex	-2.739*	1.024	.016	-4.899	-.579
	MET	-1.645	1.050	.136	-3.860	.570

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

a. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

Univariate Tests

Dependent Variable: ROM30

	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Contrast	26.322	2	13.161	3.611	.049	.298
Error	61.961	17	3.645			

The F tests the effect of Group. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

Univariate Tests

Dependent Variable: ROM30

	Noncent. Parameter	Observed Power[a]
Contrast	7.222	.587
Error		

The F tests the effect of Group. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

a. Computed using alpha = .05

Univariate Analysis of Variance

Between-Subjects Factors

		Value Label	N
Group	1.00	Ex	7
	2.00	MET	7
	3.00	Control	7

Descriptive Statistics

Dependent Variable: ROM1wk

Group	Mean	Std. Deviation	N
Ex	43.2857	5.02375	7
MET	42.1429	5.39841	7
Control	39.1429	1.86445	7
Total	41.5238	4.53452	21

Levene's Test of Equality of Error Variances[a]

Dependent Variable: ROM1wk

F	df1	df2	Sig.
1.459	2	18	.259

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Design: Intercept+ROMPre+Group

Tests of Between-Subjects Effects

Dependent Variable: ROM1wk

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	351.271[b]	3	117.090	33.194	.000	.854
Intercept	5.820	1	5.820	1.650	.216	.088
ROMPre	287.176	1	287.176	81.411	.000	.827
Group	114.204	2	57.102	16.188	.000	.656
Error	59.967	17	3.527			
Total	36620.000	21				
Corrected Total	411.238	20				

Tests of Between-Subjects Effects

Dependent Variable: ROM1wk

Source	Noncent. Parameter	Observed Power[a]
Corrected Model	99.582	1.000
Intercept	1.650	.228
ROMPre	81.411	1.000
Group	32.376	.998
Error		
Total		
Corrected Total		

a. Computed using alpha = .05

b. R Squared = .854 (Adjusted R Squared = .828)

Estimated Marginal Means

Group

Estimates

Dependent Variable: ROM1wk

Group	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Ex	43.043[a]	.710	41.544	44.541
MET	43.358[a]	.723	41.834	44.883
Control	38.170[a]	.718	36.656	39.685

a. Covariates appearing in the model are evaluated at the following values: ROMPre = 37.9524.

Pairwise Comparisons

Dependent Variable: ROM1wk

(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.[a]	95% Confidence Interval for Difference[a]	
					Lower Bound	Upper Bound
Ex	MET	-.316	1.017	.760	-2.461	1.830
	Control	4.872*	1.007	.000	2.747	6.997
MET	Ex	.316	1.017	.760	-1.830	2.461
	Control	5.188*	1.033	.000	3.009	7.367
Control	Ex	-4.872*	1.007	.000	-6.997	-2.747
	MET	-5.188*	1.033	.000	-7.367	-3.009

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

a. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

Univariate Tests

Dependent Variable: ROM1wk

	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Contrast	114.204	2	57.102	16.188	.000	.656
Error	59.967	17	3.527			

The F tests the effect of Group. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

Univariate Tests

Dependent Variable: ROM1wk

	Noncent. Parameter	Observed Power[a]
Contrast	32.376	.998
Error		

The F tests the effect of Group. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

a. Computed using alpha = .05

Instructions for Authors

General Information

The Journal of Osteopathic Medicine (J Ost Med) has a continuing call for written submissions in the following categories:

Letters to the Editor. As is common in biomedical journals the editorial board welcomes critical response to any aspect of the J Ost Med. In particular, letters that point out deficiencies, and that add to, or further clarify points made in a recently published work, are welcomed. The Editorial Board reserves the right to offer authors of papers the right of rebuttal, which may be published alongside the letter.

Authors should note that the following categories are subject to peer review. Authors names and institutions will be blinded from the referees. The referees will be selected from a panel according to their area of expertise. Referees comments will be returned to the authors and will include constructive recommendations for changes as deemed necessary.

Reviews and Original Articles. These should be either i) reports of new findings related to osteopathic medicine that are supported by research evidence. These should be original, previously unpublished works. The report will normally be divided into the following sections: abstract, introduction, materials and methods, results, discussion, conclusion, references. or ii) critical or systematic review that seeks to summarise or draw conclusions from the established literature on a topic relevant to osteopathic medicine.

Short review. The drawing together of present knowledge in a subject area, in order to provide a background for the reader not currently versed in the literature of a particular topic. Shorter in length than, and not intended to be as comprehensive as that of the literature review paper. With more emphasis on outlining areas of deficit in the current literature that warrant further investigation.

Research note. Findings of interest arising from a larger study but not the primary aim of the research endeavour, for example short experiments aimed at establishing the reliability of new equipment used in the primary experiment or other incidental findings of interest, arising from, but not the topic of the primary research. Including further clarification of an experimental protocol after addition of further controls, or statistical reassessment of raw data.

Preliminary findings. Presentation of results from pilot studies which may establish a solid basis for further investigations. Format similar to original research report but with more emphasis in discussion of future studies and hypotheses arising from pilot study.

Contributions. Include articles that do not fit into the above criteria as original research. Includes commentary and essays especially in regards to history, philosophy, professional, educational, clinical, ethical, political and legal aspects of osteopathic medicine. Issues that are of particular importance to students and new graduates may be published.

Clinical Practice. Authors are encouraged to submit descriptions of specific clinical cases they have encountered that may be of educational value. Reports should be current, succinct, and easy to read. The format for a standard method of writing case reports is available from the Editor. Brief notes and introductory comments regarding the use of new or little known treatment techniques are also welcomed. These should not be complete descriptions of an instructional nature.

MANUSCRIPT PREPARATION

Submission. Manuscripts submitted for publication should be typed on ISO A4 paper (212 by 297mm) Type only on one side of the paper. Use double spacing throughout and provide a margin of at least 25mm. Include a title page, abstract, text, acknowledgments, references, tables and legends for illustrations as appropriate. Start each section on separate pages. All pages should be numbered including the title page. If possible manuscripts should be accompanied by a copy on a carefully labelled 3.5 inch floppy disc. Please label the disc with the file name, title of article and principal author. Preference is Microsoft Word for PC or Macintosh formats. Use a plain font of size 10 or 12. Please provide three hard copies of the manuscript. Include a brief cover letter and mail in a heavy paper envelope to:

The Editor
Journal of Osteopathic Medicine
School of Exercise and Health Sciences
Campbelltown Campus
University of Western Sydney
Locked Bag 1797
Penrith Sth DC, NSW 1797
Australia

Copyright. In order to facilitate dissemination of material, copyright must be transferred to the publisher. Please ensure you include a photocopy of the Transfer of Copyright form (provided) with **all** submissions of written material.

Letters to the Editor should be typed double-spaced and mailed to the above address. Alternatively, Letters to the Editor may be e-mailed to the following address: aomr@alphalink.com.au

Letters to the editor may also be faxed to the above address at + 61 2 46203792. Original articles cannot be received via e-mail.

Units of Measurement. Reporting of data should be in the International System of Units (SI). Most biomedical journals have adopted the metric system as standard.

TEXT PAGES

Title Page. For papers to be submitted for peer review two title pages should be provided. The first should carry just the title of the paper and no information that might identify the author or institution. The second title page should carry (a) a concise informative title: (b) first, middle and last name of each author, with academic qualifications (if applicable); (c) institutional affiliation; (d) disclaimers, if any; (e) name and mailing address, e-mail address, phone and fax numbers; (f) source(s) of support in the form of funding and/or equipment.

Abstract and Key Words. An abstract of no more than 150 words should be included. The abstract should state the purposes of the study or investigation, basic procedures, main findings (give specific data and their statistical significance if possible) and principal conclusions. Emphasise new and important aspects of the study or observations. Below the abstract provide a list of 3 to 10 key indexing terms that may be published with the abstract.

Text. The text of observational and experimental articles is usually, but not necessarily, divided into sections with the headings: introduction, methods, results and discussion. Long articles may need sub-headings with some sections to clarify their content, especially the results and discussion sections. Other types of articles such as essays should be subdivided as appropriate to enhance clarity and ease of reading.

Table Pages. Type each table on a separate sheet; remember to double-space all data. If applicable, identify statistical measures of variation, such as standard deviation and standard error of mean. If data is used from another published or unpublished source, obtain permission and acknowledge in the legend. Using arabic numerals, number each table consecutively (in the order in which they were listed in the text in parentheses) and supply a brief title to appear at the top of the table above a horizontal line; place any necessary explanatory matter in footnotes at the bottom of the table. Do not submit tables as photographs; do not use any vertical lines within the table, or any horizontal lines other than at the top and bottom as specified.

Diagrams and figures. Legends for figures should be typed double spaced starting on a separate page after any Tables. All figures must be referred to in the text and identified with Arabic numerals in parentheses (eg: Figure 1) Any symbols used in the figure must be identified and explained in the legend. Figures and illustrations must be of professional quality, be black and white and of at least 127 by 173mm (5 by 7 inches) but not larger than 203 by 254mm (8 by 10 inches). All illustrations should ideally be submitted as glossy print black and white photographs, however clean camera ready artwork will also be accepted. Do not mark the print except to attach an adhesive label on the reverse side indicating the figure number, principal author name and an arrow pointing to the top of the fig-

ure. Submit all artwork between clean sheets of paper supported by cardboard so as to avoid scratches and bending during transport. Do not use paper clips on artwork. If a figure has been previously published elsewhere, the original source must be acknowledged in the legend and written permission from the copyright holder must accompany submission to the J Ost Med. Unfortunately, colour illustrations and figures cannot be accepted.

The text of original research for a quantitative or qualitative study is typically subdivided into the following sections:

Introduction. State the purpose of the article. Summarise the rationale for the study or observation. Give only strictly pertinent references and do not review the subject extensively. Do not include data or conclusions from the work being reported.

Materials and Methods. Describe your selection of observational or experimental subjects (including controls). Identify the methods, apparatus (manufacturer's name and address in parenthesis) and procedures in sufficient detail to allow workers to reproduce the results. Give references and brief descriptions for methods that have been published but are not well known; describe new methods and evaluate limitations.

Indicate whether procedures followed were in accordance with the ethical standards of the institution or regional committee responsible for ethical standards. Do not use patient names or initials. Take care to mask the identity of any subjects in illustrative material.

Describe statistical methods with enough detail to enable a knowledgeable reader with access to the original data to verify the reported results. When possible, quantify findings and present them with appropriate indicators of measurement error or uncertainty (such as confidence intervals). Discuss eligibility of experimental subjects. Give details about randomisation. Describe the methods for, and success of, any blinding of observations. Report losses to observation (such as dropouts from the study). References to statistical methods should be to standard works (with pages stated). Specify any computer programmes used in analysis of data. Restrict tables and figures to those needed to explain the argument of the paper and to assess its support. Use graphs as an alternative to tables with any entries; do not duplicate data in graphs and tables. Define statistical terms, abbreviations and most symbols.

Results. Present results in logical sequence in the text, tables and illustrations. Do not repeat in the text all the data in the tables or illustrations. Emphasise or summarise only important observations.

Discussion. Emphasise the new and important aspects of the study and the conclusions that follow from them. Do not repeat in detail data or other material given in the introduction or the results section. Include implications of the findings and their limitations, include implications for future research. Relate the observations to other relevant studies. Link the conclusion with the goals of the study, but avoid unqualified statements and conclusions not completely supported by your data. State new hypothesis when warranted, but clearly label them as such. Recommendations, when appropriate, may be included.

Acknowledgments. In the appendix one or more statements should specify (a) contributions that need acknowledging, but do not justify authorship (b) acknowledgments of technical support (c) acknowledgments of financial and material support, specifying the nature of the support. Persons named in this section must have given their permission to be named. Authors are responsible for obtaining written permission from those acknowledged by name since readers may infer their endorsement of the data and conclusions.

References. Number references consecutively in the order in which they are first mentioned in the text. Identify references in text, tables and legends by numerals as superscripts. References cited only in tables or in legends to figures should be numbered in accordance with a sequence established by the first identification in the text of the particular table or illustration.

Try to avoid using abstracts as references; 'unpublished observations' and 'personal communications' may not be used as references, although references to written, not oral, communications may be inserted. Include among the references papers accepted but not yet published; designate the journal; and add 'in press' (in parentheses). Information from manuscripts submitted but not yet accepted should be cited in the text as 'unpublished observations' (in parentheses).

When a previously cited reference is used again, it is designated in the text (as a superscript) by the number originally assigned to it by it's first use. Do not assign it another number or list it again in the reference list as 'op. cit.'

When using an author's name in the text the superscript reference must follow immediately after the name eg.:

Smith[7] states that...

When adjacent to punctuation, superscripts are always placed after the punctuation eg.:

...Brown and co-workers,[8] using a new method...

...total health of the patient.[9]

References must be verified by the author(s) against the original document.

Examples of correct forms of referencing are given below. It is the authors' responsibility to ensure that reference titles are accurate and provided in full.

Journals

Standard journal article. List all authors when six or less; when seven or more, list only first three and add 'and co-workers'.

1. Russel R, Groves P, Taub N, O'Dowd J, Reynolds F. Assessing long term backache after childbirth. *British Medical Journal*. 1993; 306: 1299-1303.

No author given

2. Anonymous. Cervical manipulation: anatomy of a disaster. *Medical Practice*. 1986; July: 27-26.

Books

Personal author(s)

1. Mitchell FL, Jr. *The Muscle Energy Manual. Volume 1*. East Lansing, Mich: MET Press; 1995: 166-167.

2. Travell JG, Simons DG. *Myofascial Pain and Dysfunction: The Trigger Point Manual*. Baltimore: Williams & Wilkins Co.; 1983.

Editor, compiler, chairman as author

3. Ward RC. Ed. *Foundations for Osteopathic Medicine*. Baltimore: Williams & Wilkins; 1997: 1127.

Chapter in a book

Knapp ME. Massage. In: Kottke FJ, Lehmann JF, eds. *Krusen's Handbook of Physical Medicine and Rehabilitation*. 4th ed. Philadelphia, Penn: WB Saunders; 1990: 433-435.

Symposium

4. Aston-Jones G, Valentino R. Brain noradrenergic neurons, nociception and stress: basic mechanisms and clinical implications. In: Willard FH, Patterson MM, eds. *Nociception and the Neuroendocrine-Immune Connection, 1992 International Symposium*. Indianapolis,Ind: American Academy of Osteopathy; 1992: 107-132.

Dissertation or thesis

5. Cairns RB. Infrared spectroscopic studies of solid oxygen (dissertation). Berkeley, California: University of California, 1965. 156p.

Newspaper article

6. Shaffer RA. Advances in chemistry are starting to unlock mysteries of the brain: discoveries could help cure Alcoholism and insomnia, explain mental illness. How the messengers work. Wall Street Journal 1977 Aug 12:1(col 1), 10(col 1).

Magazine article

7. Roueche B. Annals of medicine: the Santa Claus culture. The New Yorker 1971 Sep 4: 66-81.

Note: These requirements are based largely after: *Uniform Requirements for Manuscripts Submitted to Biomedical Journals*, by the International Committee of Medical Journal Editors.