

A COMPARATIVE STUDY BETWEEN MAITLAND MOBILIZATIONS VERSUS MUSCLE ENERGY TECHNIQUES IN PATIENTS WITH MECHANICAL NECK PAIN

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ABSTRACT

Aim and Objective: To find out the effectiveness of Maitland mobilization verses Muscle Energy Technique on Mechanical neck pain patients.

Methods: 30 patients with mechanical neck pain aged between 18-50 years (male and female) were selected for the study. They were assessed and randomly divided into Two equal groups consisting 15 patients in each group. Group A patients were assigned To receive Maitland mobilization and group B patients were assigned to receive Muscle Energy Technique. Treatment was given for 5 days in a week for 3 weeks. The outcome measures used were pain intensity levels via visual analogue scale (VAS), and neck disability index (NDI).

Results: Study showed significant reduction in pain, in both groups. But Group A patients showed greater reduction in pain (VAS), and a greater reduction in disability (NDI score) than group B patients after 3 weeks of treatment.

Conclusion: The Present Study concludes that the Maitland mobilization is more effective in reducing pain and reduction in disability as compared to Muscle energy technique in mechanical neck pain patients.

KEY WORDS: Mechanical neck pain, Maitland mobilization, MET, VAS, NDI.

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Access this Article online	Journal Information
Quick Response code 	International Journal of Physiotherapy and Research ISSN (E) 2321-1822 ISSN (P) 2321-8975 https://www.ijmhr.org/ijpr.html DOI-Prefix: https://dx.doi.org/10.16965/ijpr 
	Article Information
	Received: 16 Jul 2020 Peer Review: 16 Jul 2020 Revised: None
	Accepted: 12 Aug 2020 Published (O): 11 Sep 2020 Published (P): 11 Oct 2020

DOI: 10.16965/ijpr.2020.156

INTRODUCTION

Neck pain is defined as pain in the head and neck region caused by degenerative disease, trauma, inflammatory or mechanical disorders. Neck pain arising from habitual postures has been referred as “Non-specific Neck Pain” or “Mechanical Neck Pain”. Neck pain is a very common problem, second only to low back pain in its frequency in the general population [1,3]

and in musculoskeletal practice.[4]. this is because neck is one of the most complicated structures of the body which permits a wide range of motion for head in relation to the trunk. Tailors assume a flexed neck posture while performing their stitching work for a prolonged period of time. This causes abnormal shortening of one group of muscle with unwanted stretching in other group of muscles leading to

change in load distribution and imbalances in cervical spinal alignment and stress in soft tissue structures around neck. Bogduk & McGuirk et al also suggested that neck pain may be subdivided into upper cervical spinal pain and lower cervical spinal pain, above and below an imaginary transverse line through C4. From upper cervical segments, pain can usually be referred to the head whereas from the lower cervical segments pain can be referred to the scapular region, anterior chest wall, shoulder or upper limb [5].

The Bone & Joint Decade 2000-2010 Task Force on Neck Pain & its associated disorder describes neck pain as pain located in the anatomical region of the neck with or without radiation to head, trunk or upper limbs. The Australian Acute Musculoskeletal Pain guidelines group suggested the term Idiopathic Neck Pain for neck pain without any known cause. The Neck Task Force proposed the terms Translatory neck pain instead of acute, short duration neck pain for sub-acute and long duration neck pain to replace chronic neck pain [6].

Mechanical neck pain, also known as non-specific or simple neck pain, is the most common form of pain in the neck, affecting two out of three people at some point in their lives. Mechanical neck pain refers to pain that has been present for less than 3 months. According to several studies of patients, neck pain may underlie impaired postural balance (Marie B. Jorgensen et al., 2011)[7]. Most patients who present with neck pain have non specific (simple) neck pain, where symptoms have a postural or mechanical basis. Etiological factors are poorly understood and are usually multifactorial, including poor posture, anxiety, depression, neck strain, and sporting or occupational activities (Haqberg et al., 2000) [8,9]. Mechanical neck pain may have different symptoms, it may be one side or both sides of the neck, cause headaches, stiffness and may lead to restricted motion in one or all directions in the range of neck motion. It does not refer to the severity or quality of pain[10]. Neck pain is common source of disability, little is known about its prevalence and course. In the general population up to 30%-50% of adults experience neck pain at least once per year (Martin Scherer et al., 2012)[11].

Non-specific neck pain has a postural or mechanical basis and affects about two thirds of people at some stage especially in middle age. Acute neck pain resolves within days or weeks but may become chronic in about 10% of people [12].

Neck pain is becoming increasingly prevalent in society. The current research incidence of neck pain in India has been estimated as 35% and the median age as 27 years and it ranges between 18 to 52 years. Epidemiological surveys show that 45-71% of people recall an episode of neck pain that affected their activities of daily living [13]. Prevalence is generally higher in women compared to men, higher in high-income countries compared with low- and middle-income countries and higher in urban areas compared with rural areas [14]. Many times, mechanical neck pain is associated with headaches that may radiate into the base of the skull, side of the head (temporal) or around the eyes (periorbital). These headaches are called cervicogenic or neck related headaches. Most neck pain does not have one simple cause, but is a result of a range of conditions that affect joints, muscles, tendons and the other tissues in the neck. Factors that can contribute include tension and sustained or repetitive activity, such as using the telephone a lot, sitting at computer screens or in front of the television, playing a musical instrument, and long-distance driving.

Hanten et al. and Lee et al [15,16]. Observed that neck pain causes range of motion (ROM) reduction, which may be linked to mechanical restriction between two or more vertebrae. According to Barnsley[17] such restriction may be caused by pain, fiber contracture, bone ankylosis, or muscle spasm. A patient with neck pain may also present a posture imbalance resulting from shortening and increased activation of suboccipital, sternocleidomastoid, upper trapezius, pectoralis, and rotator cuff muscles[18].

Pragmatic reviews have in the past extolled the virtues of a variety of treatments for neck pain [19-21]. These include education, rest, collars, posture control, exercises, physical modalities, traction, mobilization, massage, analgesics, tricyclic antidepressants, psychological

interventions, trigger point injections, occipital nerveblocks, epidural steroid injections, neurectomy, discectomy, fusion, soft tissue technique, muscle energy technique, thrust technique, myofascial release, mobilization and craniosacral manipulation. None of the reviews, however, provided any scientific evidence of efficacy of any of these traditional interventions [22].

In this study our aim was to compare Maitland mobilization with Muscle Energy technique for the patients with Mechanical Neck Pain.

METHODS

An ethical clearance for the study was obtained from the ethical committee of the Institute. In order to meet the purpose of the study a planned and careful procedure was chosen before proceeding further. In this study initially 43 clinically diagnosed neck pain patients attended the settings. After screening with inclusion and exclusion criteria, Finally thirty patients were assigned for the study into two groups by simple random Sampling technique. The selected patients underwent the detailed assessment with the parameters for study Visual Analog Scale, Neck disability index. The patients were randomly selected to Group A (N= 15male/female) and Group B (N= 15 male/female).

On the first day selected patients underwent a detailed assessment. The patients were divided into group-A & group-B by randomization. Then Group A patients received Maitland Mobilization Technique and Group B patients received Muscle Energy Technique (MET).

Before proceeding with Maitland mobilization diagnostic oscillatory glides are performed from C2 to C7 to locate the involved segment(s).

Group A patients received the following interventions: Posterior anterior unilateral pressure (PAUP), Central Posterior to Anterior glide (Central PA) and Transverse glide.

Procedure: For all three interventions the patient were made to lie on relaxed prone position with palms supporting forehead. For PAUP and central PA the therapist stands in the head end of the patient. For transverse PA the therapist stands at the side of the patient. After giving a clear instruction the therapist glides the appropriate vertebrae.

For Central PA the thumbs of the therapist contact the spinous process at the affected level. For PAUP the thumbs contact the appropriate transverse process posteriorly. For Transverse glide standing at the side the therapist's thumbs contact the side of the spinous processes while other fingers comfortably spread around the neck. For all three techniques the therapist performs alternate small and large amplitude oscillations (I and II grades) within the pain free range for 60 seconds with a staccato rhythm followed by a two minute interval after which another 60 seconds of oscillations are given. Treatment is repeated on each affected cervical vertebra during each session for every patient in this group. This treatment was given 5 times per week for 3 weeks [23-26].

GROUP B: Muscle Energy Technique: For MET interventions in three directions of motion are chosen i.e. flexion, extension and rotation (both left and right). Lateral flexion is not taken into account as it is a less functional movement in the neck.

For all three interventions the patient was put in relaxed supine position. For extension and rotation MET the head is taken out of the couch. The therapist stands at the side of the patient's head for flexion MET and at the head end of the patient for other two interventions.

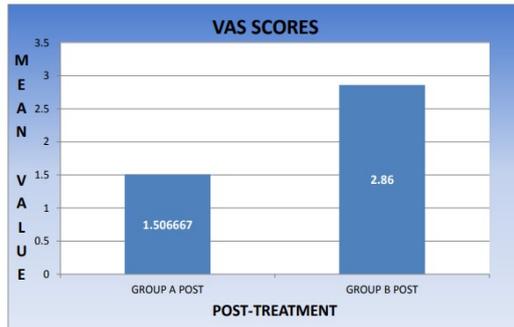
For Flexion MET the therapist tucks the chin of the patient with one hand and with the other hand behind the patient's occiput passively moves the patient's head into the barrier. Upon finding the bind the therapist instructs the patient to contract either flexors(for RI, against gravity by asking to hold the head in the air) or extensors (PIR)isometrically for 10 seconds with a mild contraction and then asked to relax. Upon completion of this the patient takes a deep breath and breathes out to produce further relaxation. The neck is taken slowly into further flexion towards the new barrier. For extension and rotation similar procedure is followed only the hand position changes. For extension the therapist cradles the occiput with one hand and the vertex is supported by the therapist's abdomen. The other hand is placed on the chin of the patient. For rotation the therapist's hands are placed on the sides of the patient's head in

such a way that the thenar and hypothenar eminence contacts the temple whereas the fingers comfortably rest on the cheek of the patient.

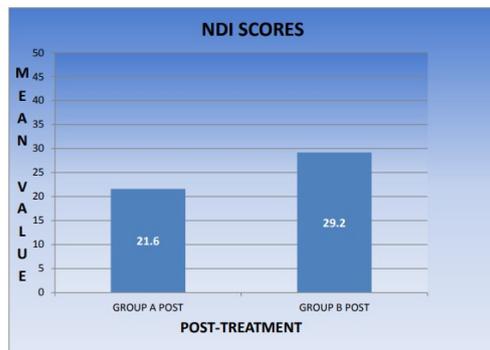
Each technique is provided for 5 repetitions in a session. They are given for 5 times a week for 3 weeks.

RESULTS

COMPARISON OF POST-TREATMENT VAS SCORE BETWEEN GROUP-A & GROUP-B



COMPARISON OF NDI SCORE BETWEEN TWO GROUPS (GROUP-A & GROUP-B) (POST-TREATMENT)



Maitland Mobilization for 3 weeks and Group B patients were given Muscle energy technique for 3 weeks. The outcomes were measured by VAS, NDI. Both the groups were considered homogeneous with regards to outcome measures values taken at the first day of assessment. Intragroup comparison was analyzed by paired t test, whereas the intergroups comparison were assessed by independent Fischer's "t" test. The data were analyzed keeping the level of the level significance at 0.05.

The mean score of VAS score reduced from a mean of 5.58667 to 1.50667 in Group-A(Maitland Mobilization group) whereas in Group-B (Muscle energy technique group)the mean improve from 5.52667 to 2.86. The pain score analysis for

intergroup comparison shows significant improvement in group-A subjects as compared to group B ($p= 6.06474 \times 10^{-05}$), thus indicating Maitland Mobilization to be more effective towards pain reduction. Although, intergroup analysis clearly depicts both interventions to be effective in pain relief.

Neck disability index (NDI) improved from a mean of 46.62 to 29.2 in Group-A (Maitland Mobilization group) whereas in Group-B (Muscle energy technique group) the mean improved from 47.06667 to 29.2. The intra group analysis clearly depicts both interventions to be effective in reducing pain. The score analysis for intergroup comparison shows the significant improvement in Group-A subjects as compared to group-B subjects ($p=0.039621837$). Thus indicating Maitland Mobilization to be more effective than Muscle energy technique

DISCUSSION

Neck pain is a common complaint in the general population with the lifetime prevalence of approximately 50%. Most patients who present with chronic neck pain symptoms fit into the category of nonspecific neck pain, having postural or mechanical basis. Aetiological factors include poor posture, neck strain or occupational or sporting activities, anxiety, depression, but are often multifactorial and poorly understood and its exact pathology remains obscure.

Very few studies have compared the Maitland Mobilization and MET in patients suffering with mechanical neck pain. Thus this study was conducted to compare the effectiveness of Maitland mobilization versus that of MET in mechanical neck pain. 30 early adulthood patients were selected as per the preset criteria for this study who were assigned randomly into two groups. Group A received Maitland mobilization whereas group B received MET.

Compliance was good among the patients who fulfilled intervention and there were no dropouts during the study.

The results of this comparative study demonstrated that there was more statistically significant improvement with Group A treatment than Group B treatment in patients suffering

from mechanical neck pain. Although, both interventions resulted in reduction of neck pain. My study demonstrated a more significant reduction of pain in group A than B. This was found in both the groups over 2 weeks of treatment with Maitland mobilization and MET. When comparing the pre and post treatment, VAS score between the two groups, the Group A treatment (mean of pre and post VAS from 5.586667 to 1.506667) showed much better improvement than the Group B (mean of pre 5.1 and post VAS from 5.526667 to 2.86) treatment. This is evident by the statistical results, where p value between the groups have consistently shown that subjects under Group A have produced better reduction in VAS score, and improvement in NDI. The study indicates that Maitland Mobilization was better when compared to MET

Reduction of pain in Maitland Mobilization probably because Maitland mobilization works primarily on joints and have a secondary effects on muscles whereas Muscle energy technique works primarily on muscles and have secondary effects on joints. Posterior anterior unilateral pressure (PAUP) is especially important technique for upper cervical disorder, particularly when aimed at restoring a full range of pain free movements to prevent or lessen recurrence. 61.53 Nevertheless, the difficulty of stabilizing a transverse pressure on the spinous process (especially on obese patients) and the resistance offered by the neck extensor muscle contraction to both TOP and PAUP seem to have constituted a obstruction that makes it difficult to stretch the affected joint. The result showed that PAUP has given the same intensity of pain therefore, PAUP may facilitate the application of appropriate force magnitude during digital pressure and adequate number of oscillations to mobilize the affected joints and stretch the soft tissues to achieve unrestricted and pain-free cervical motion, hence it is superior analgesic potency over the other technique (TOP) used in this study. Maitland points out that care must be taken to ensure that the thumbs are positioned immediately over the transverse process for an effective pressure therapy.

Muscle energy technique is established manipulative intervention often used to treat somatic

dysfunction of the spine. Muscle energy technique has been advocated for the treatment of restricted range of motion in upper neck. MET can be used to lengthen shortened musculature and improve joint function range of motion. MET also helped to reduce neck pain, disability and improve CROM which was statistically significant.

30 subjects who met the inclusion criteria were assigned into two groups, group-A and group-B. Group-A included 15 subjects who were treated with Maitland mobilization. Group-B included 15 subjects who were treated with Muscle energy technique. The result of this study supports that Maitland mobilization has much better improvement compared to Muscle energy technique. Statistical analysis showed that the mean of VAS score in group-A (Maitland mobilization group) is 5.586667 before treatment and 1.506667 after 3 weeks of treatment ($p=1.68148 \times 10^{-12}$) and for group-B (Muscle energy technique group) it is 5.526667 before treatment and 2.86 after treatment ($p=1.37529 \times 10^{-7}$). Both groups showed significant reduction in VAS score, but group-A showed better improvement than group-B.

The other outcome measure was Neck Disability Index (NDI). Statistical analysis showed that NDI scores better improvement in favor of group-A than group-B. In group-A, average mean of NDI (Neck Disability Index) scores are 46.62 before treatment and 21.6 at the end of 2nd week of treatment ($p=2.432 \times 10^{-5}$). In group-B it is 47.066667 before treatment and 29.2 at the end of 2nd week of treatment ($p=7.11615 \times 10^{-5}$). This indicates that group-A is significantly better than group-B.

During the course of study it was also noted that patient's education about neck pain and ergonomic advice for self-care and methods of modifying risk factors add more benefit in either of treatment groups. This may help the patients to understand more about their condition and may improve psychological well-being to carry out the activities. The strength of this study were the standardized measure procedure, the use of reliable and valid outcome measures, the measurement was blinded to both group for the outcome assessment and statistical analyses, the attempt to follow a treatment

guideline and the good compliance in the interventions. Based on the results of our study we can definitely recommend use of Maitland mobilization for mechanical neck pain.

From the study it was concluded that Maitland Mobilization is effective in reducing mechanical neck pain, as compared to Muscle energy technique over a period of 3 weeks of treatment in early adulthood tailors with mechanical neck pain. However, both interventions appear to have a positive effect in pain reduction, and Maitland Mobilization is the comparatively better than Muscle energy technique for mechanical neck pain patients. As the differences of all outcome measures were greater Maitland mobilization, it seems to be a favorable treatment option for tailors with mechanical neck pain.

Conflicts of interest: None

REFERENCES

- [1]. Nachemson A, Waddell G, Norlund AI. Epidemiology of neck and back pain. Neck and Back Pain: The Scientific Evidence of Causes, Diagnosis and Treatment. Philadelphia, PA: Lippincott Williams and Wilkins; 2000;165-187.
- [2]. Wolsko PM, Eisenberg DM, Davis RB, Kessler R, Phillips RS. Patterns and perceptions of care for treatment of back and neck pain: results of a national survey. Spine. 2003;28:292-298. <https://doi.org/10.1097/01.BRS.0000042225.88095.7C> <https://doi.org/10.1097/00007632-200302010-00018> PMID:12567035
- [3]. Webb R, Brammah T, Lunt M, Unwin M, Allison T, Symmons D. Prevalence and predictors of intense, chronic and disabling neck and back pain in the UK general population. Spine. 2003;28:1195-1202. <https://doi.org/10.1097/00007632-200306010-00021> <https://doi.org/10.1097/01.BRS.0000067430.49169.01> PMID:12782992
- [4]. Waalen DP, White TP, Waalen JK. Demographic and clinical characteristics of Chiropractic patients: a five-year study of patients treated at the Canadian Memorial Chiropractic College. J Can Chiro Assoc. 1994;38:75-82.
- [5]. Bogduk N., McGuirk B. Management of acute and chronic neck pain: an evidence based approach. Pain research and clinical management. 1st ed. Elsevier; Philadelphia: 2006. : 3-20.
- [6]. Marie B. Jorgensen, Joregen H. Skotte, Andreas Holtermann, Gisele Sjogaard, Nicolas C. Peterson & Karen Sogaard; Neck Pain and Postural Balance among workers with high postural demands - a cross sectional study; Biomedcentral - musculoskeletal disorders 2011;12:176. <https://doi.org/10.1186/1471-2474-12-176> PMID:21806796 PMID:PMC3161921
- [7]. Haqberg M, Harms Ringdahl K, Nisell R, Hjelm E.W.; Rehabilitation of Neck Shoulder Pain in women industrial workers: a randomized trial comparing isometric shoulder endurance training with isometric shoulder strength training; Arch Physiological Medical Rehabilitation 2000 Aug;8:18:1051-8. <https://doi.org/10.1053/apmr.2000.7582> PMID:10943754
- [8]. JOHN D. CHILDS et al, Clinical Practice Guidelines Linked to the International Classification of Functioning, Disability, and Health from the Orthopedic Section of the American Physical Therapy Association Journal of Orthopedics Sports Physical Therapy 2008;389:A1-A34.
- [9]. Merskey H: A list with definition and notes on usage recommended by the IASP subcommittee on taxonomy pain journal of Australian government national health and medical research council. 1979;6:249-252.
- [10]. Martin Scherer, Helene Schaefer, Eva Blozik, Jean Francois Chenot, Wolfgang Hinumel. The experience and management of neck pain in general practice-the patients perspective; European Spine Journal 2010;19:963-971. <https://doi.org/10.1007/s00586-010-1297-x> PMID:20151163 PMID:PMC2899974
- [11]. D.G. Hoy, M. Protani, R. De, R. Buchbinder; The epidemiology of neck pain; Best Practice & Research Clinical Rheumatology 2010;24:783-792. <https://doi.org/10.1016/j.berh.2011.01.019> PMID:21665126
- [12]. Hanten WP, Olson SL, Russel JL, Lucio RM, Campbell AH. Total head Excursion and resting head posture: normal and patient comparisons. Arch Phys Med Rehabil 2000;81:62-64. <https://doi.org/10.1053/apmr.2000.0810062> [https://doi.org/10.1016/S0003-9993\(00\)90223-5](https://doi.org/10.1016/S0003-9993(00)90223-5)
- [13]. Lee H, Nicholson LL, Adams RD. Cervical range of motion associations with subclinical neck pain. Spine. 2004;29:33-40. <https://doi.org/10.1097/01.BRS.0000103944.10408.BA> PMID:14699273
- [14]. Barnsley L. Neck pain. In: Klippel JH, Dieppe PA. Rheumatology. 2nd ed. London: Mosby-Year Book; 1998:41-2.
- [15]. Wang WTJ, Olson SL, Campbell AH, Hanten WP, Gleeson PB. Effectiveness of physical therapy for patients with neck pain: an individual approach using a clinical decision-making algorithm. Am J Phys Med Rehabil. 2003;82:203-18. <https://doi.org/10.1097/01.PHM.0000052700.48757.CF> <https://doi.org/10.1097/00002060-200303000-00009> PMID:12595773
- [16]. Greenman PE. Manual and manipulative therapy in whiplash injuries. Spine: State of the Art Reviews 1993;7:517-530.
- [17]. N. Bogduk. The neck. Best Pract Res Clin Rheumatology. 1999; 13: 261-285. <https://doi.org/10.1053/berh.1999.0020> PMID:10952864
- [18]. heralkald AJ. Effect of manual therapy on connective tissue. Phys Ther. 1992Dec; 72(12):893902. <https://doi.org/10.1093/ptj/72.12.893> PMID:1454865

- [19]. B. Cagnie, L. Danneels, D. Van Tiggelen, V. De Loose, D. Cambier. Individual and work related risk factors for neck pain among office workers: a cross sectional study. *Eur Spine Journal* 2007; 16:679-686. <https://doi.org/10.1007/s00586-006-0269-7> PMID:17160393 PMCID:PMC2213555
- [20]. T.T. Chiu, W.Y. Ku, M.H. Lee, et al; A study on the prevalence of and risk factors for neck pain among university academic staff in Hong Kong, *Journal of Occupational Rehabilitation* 2002;12:77-91. <https://doi.org/10.1023/A:1015008513575> PMID:12014228
- [21]. Kaur IL, Runmazhi R, Arfath U. Effect of Maitland versus Mulligan mobilization technique on upper thoracic spine in patient with non-specific neck pain - a comparative study *International Journal of physiotherapy and Research*. 2013;1(5):214-218.
- [22]. Miriam marks, T. Schottker-Koniger, A. Probst: Efficacy of cervical spine mobilization versus peripheral nerve slider techniques in cervico-brachial pain syndrome- A randomized clinical trial; *J. Phys. Ther*, 2011;4:9-17
- [23]. Kanlayanaphotporn R, Chiradejnant A, Vachalathiti R. The immediate effects of mobilization technique on pain and range of motion in patients presenting with unilateral neck pain: a randomized controlled trial. *Arch Phys Med Rehab*. 2009;90; 187-192. <https://doi.org/10.1016/j.apmr.2008.07.017> PMID:19236972
- [24]. Raymond Y Lee, Alison H McGregor, Anthony M J Bull, Paul Wragg. Dynamic responses of the cervical spine to postero-anterior mobilization. *Journal of manual therapy*. 2008;20:103-108.
- [25]. E.L. Hurwitz, H. Morgenstern, P. Harber, G.F. Kominski, F. Yu and A.H. Adams, A randomized trial of chiropractic manipulation and mobilization for Patients with neck pain: clinical outcomes from the UCLA neck-pain study, *Am J Public Health* 2002;92:1634-1641. <https://doi.org/10.2105/AJPH.92.10.1634> PMID:12356613 PMCID:PMC1447299
- [26]. Hurwitz E L, Aker P D, Adams A H, Meeker W C, Shekelle P G. Manipulative and mobilization of cervical spine- a systemic review of literature. *Spine* 1996;21:1746-1760. <https://doi.org/10.1097/00007632-199608010-00007> PMID:8855459
- [27]. Viswas Rajadurai. The effect of Muscle Energy Technique on Temporomandibular Joint Dysfunction: A Randomized Control Trial. *Asain Journal of Scientific Research*. 2011;4:71-77. <https://doi.org/10.3923/ajsr.2011.71.77>
- [28]. Fryer G, Ruszkowski W, et al. the effect of change to duration of isometric Contraction in muscle energy technique to the upper cervical spine: *Journal of Osteopathic Medicine*.2001;4:8-14.
- [29]. Howard Vernon, the Neck Disability Index: State-of-the-Art, 1991-2008, *Journal of Manipulative and Physiological Therapeutics*, September 2008, Volume 31:491-502. <https://doi.org/10.1016/j.jmpt.2008.08.006> PMID:18803999
- [30]. Bijur PE, Silver W, Gallagher EJ: Reliability of the visual analog scale for measurement of acute pain. *Acad. Emerg Med*. 2001 Dec; 8(12):1153-7. <https://doi.org/10.1111/j.1553-2712.2001.tb01132.x> PMID:11733293
- [31]. Stant Grant, Tom Aitchison et al: A comparison of the reproducibility and the sensitivity to change of visual analogue scales, Borg scales, Lickert scales in normal subjects during sub maximal exercise. *Chest*, 1999; 116: 1208-1217. <https://doi.org/10.1378/chest.116.5.1208> PMID:10559077
- [32]. Vernon H, Mior S. Neck disability index- a study of reliability and validity. *Journal of manipulative physiological therapeutics*. 1991 September; 14:7:409-415. <https://doi.org/10.1037/t35122-000>
- [33]. G.B. Langley and H. Sheppard. The visual analogue scale: its use in pain Measurement: *Medical Research Laboratory, Rheumatol Int* 1985; 5: 145-148. <https://doi.org/10.1007/BF00541514> PMID:4048757
- [34]. Fejer R, Kyvik KO, Hartvigsen J. The prevalence of neck pain in the world Population: a systematic critical review of the literature, *Eur Spine J*.2006;15:834-848. <https://doi.org/10.1007/s00586-004-0864-4> PMID:15999284 PMCID:PMC3489448
- [35]. Cote, P, Cassidy JD, Carroll L. The Saskatchewan health and back pain survey: The prevalence of neck pain and related disability in Saskatchewan adults. *Spine*. 1998; 23: 1689-1698. <https://doi.org/10.1097/00007632-199808010-00015> PMID:9704377
- [36]. Binder A. The diagnosis and treatment of nonspecific neck pain and whiplash. *Europa Medicophysica*. 2007; 43: 79-89.
- [37]. Ahn NU, Ahn UM, Ipsen B, an HS. Mechanical neck pain and cervicogenic headache, *Neurosurgery*. 2007; 60: S21-S27. <https://doi.org/10.1227/01.NEU.0000249258.94041.C6> PMID:17204881
- [38]. Anita R. Gross et al: Knowledge to Action: A Challenge for Neck Pain Treatment. *J. Orthop Sports Phys Ther*. 2009; 39:5: 351-363. <https://doi.org/10.2519/jospt.2009.2831> PMID:19521013
- [39]. Michael Ogonnia Egwu. Relative Therapeutic Efficacy of Some Vertebral Mobilization Techniques in the Management of Unilateral Cervical Spondylosis: A Comparative Study. *Journal of PhysTherScience*. 2008;20:103-108. <https://doi.org/10.1589/jpts.20.103>

How to cite this article: Dhanasekaran Pitchai, Venkatesan Ramakrishnan, Rajashreekar. A COMPARATIVE STUDY BETWEEN MAITLAND MOBILIZATIONS VERSUS MUSCLE ENERGY TECHNIQUES IN PATIENTS WITH MECHANICAL NECK PAIN. *Int J Physiother Res* 2020;8(5):3595-3601. DOI: 10.16965/ijpr.2020.156