ISSN (Online) 2456 -1304

International Journal of Science, Engineering and Management (IJSEM)
Vol 6, Issue 6, June 2021

Management of Myofascial Trigger Points of Upper Trapezius in Smart Phone Users-A Two Group Comparison Study

[1] Anjali Suresh*, [2] Rama Chandra Prasad L.A, [3] Prasanna Mohan

[1] Research Scholar, Department of Physiotherapy, Garden City University, Bangalore, India
[2] Assistant Professor, Department of Physiotherapy, Garden City University, Bangalore, India
[3] Associate Professor, Department of Physiotherapy, Garden City University, Bangalore, India
E-mail: [1] anjali.mpt@gmail.com

Abstract--- Background/aim: The smartphone is a boon to our daily life activities but at the same overuse of it has brought about numerous musculoskeletal problems. The neck is the most affected part of the body.Two manual techniques of Myofascial release for trigger points of the upper trapezius were compared along with Ultrasound therapy. The smartphone addiction scale -short version was administered to all participants to determine the level of addiction and those who scores were high were included in the study. The set criteria in the study included the pain intensity on the visual analogue scale (VAS) ,Pain pressure threshold using Algometer and Craniovertebral angle using the ON protractor app.

Subjects and methods: This study assessed the outcome measures within and between groups before, after the intervention and a follow-up was done after 15 days. The target population were smartphone users between the age group of 18 to 35 years. 106 subjects (48 males, 53 females) participants who had been selected from among the eligible participants of 176 and who had TrPs in their upper trapezius muscle.

Results: The effect of Trigger point release and Myofascial release on patients of each group with TrPs in the upper trapezius muscle resulted in increase of cervical lateral flexion ($P < 0.001$), decreased pain intensity on VAS ($p < 0.001$) and,pain threshold ($p<0.001$) was increased and the craniovertebral angle was increased ($p<.001$) within in the groups and between the group there was no significance .

Conclusion: The study concluded that both manual techniques i.e., Trigger point release and Myofascial release were effective and neither technique is superior to the other.

Keywords--- Myofascial release, trigger points, Upper trapezius muscle, Smartphone users. Trigger point release

I. INTRODUCTION

In the current era of digitalization, smartphones are a necessity in everyone's daily life and the numbers are increasing worldwide. Many at times the smartphone users handle the device for leisure activities as well as for educational purpose, throughout the day. Smartphones are widely used now a days to complete learning activities in academic institutions, and the use and development of mobile applications are rising. According to TRAI the number of wireless subscribers is 1,160.59 million as against the population of 1.33 billion. The values give us an idea regarding increasing popularity of usage of smartphones in India. The use of electronic devices has both pros and cons. [1-4] Many studies have shown that the time spent on the usage of smartphones and directly proportionate to the possibility of developing musculoskeletal symptoms. [5–8] This repeated use on a small device requires compromise of body structures and positions which can result in musculoskeletal disorder of the neck, upper extremity, and low back. Population based surveys have shown lifetime prevalence of neck pain between 67% and 87% [1]. Pain in the Trapezius muscle occurs due to stress and is the most common musculoskeletal disorder which leads to long and serious disability. The upper trapezius muscle is highly susceptible to overuse as it is a postural muscle [9,10]

Due to continuous contraction of the muscle knots in the muscles are created due to overload. These are known as trigger points leading to pain [10,11]. Myofascial trigger point is most found in the midpoint of upper border of trapezius [10]. Tenderness and knots are felt on palpation in the belly of the muscle. [12]. A tight muscle reduces the range of neck movements. Neck pain and restricted movements give a subjective feeling of stiffness which further increases the pain and results in muscle spasm, increases the soft tissue tightness, with an ensuring pain–spasm cycle which can be difficult to break [9,12]. It is

All Rights Reserved © 2021 IJSEM

ISSN (Online) 2456 -1304

International Journal of Science, Engineering and Management (IJSEM)
Vol 6, Issue 6, June 2021

essential to provide relief and to improve the function. Physiotherapy is the choice of treatment for trapezius muscle pain which includes many different electrotherapeutic procedures, and active treatment such as exercise therapy. There are a number of soft tissue manipulation techniques like Positional Release Therapy (PRT), Muscle Energy Technique (MET), MFR etc., which are also used for relief of muscle pain & spasm [13].

This study compared the effectiveness of two techniques i.e., trigger point release and MFR. In trigger point release, ischaemic compression using deep digital pressure is applied over the tender point (trigger point) in a shortened position of the muscle This will break the adhesions [14,15]. Myofascial Release (MFR) is a soft tissue mobilisation technique. It can be defined as "the facilitation of mechanical, neural and psychophysiological adaptive potential as interfaced via the myofascial system [10]. MFR therapy involves long duration mechanical forces which is of low load, and which manipulates the myofascial complex, these techniques restore optimal length, decreases pain, and improves function [13]. In MFR along with the manual traction, prolonged stretching of the fascia results in muscle to break down the adhesions, thus helps to decrease the pain and increase flexibility and thereby increase ROM [16]. There are many studies which shows the effectiveness of both the techniques either individually or with some other technique but there is dearth in the literature comparing the effectiveness between two techniques TrP release and MFR in patients with myofascial trigger point in the upper trapezius in smartphone users. [17]. Therefore, this study aims to compare the effects of both techniques on craniovertebral angle and pain pressure threshold in smartphone users with myofascial trigger points of upper trapezius muscle.

II. MATERIALS AND METHODS

This was a randomised interventional study. Before the commencement of this study, ethical approval was sought and obtained from the Ethical Committee of Garden City University. The participants were informed about the type of study and an informed consent form was taken from them. Thereafter, the pre assessment and assessment procedures were carried out, and the participants who met the inclusion criteria were a part of the study. The outcome measures were Visual analogue Scale (VAS), Craniovertebral angle and Pain pressure threshold.

Smartphone assessment Scale -short version was administered to all the participants who volunteered for this study. A total 179 participants between the age group of 18 to 35 years of age were assessed for eligibility ,69 participants were excluded from the study as they did not fulfil the inclusion criteria and 110 participants were a part of this study. There were 2 dropouts in each group and in total 4. The data was analysed for 106 participants. Participants having radiculopathy, neck and back deformities like torticollis or scoliosis, history of trauma or fracture or surgery in the neck or upper back or shoulder, any skin diseases in the trapezius, those who were on anticoagulation therapy, long term corticosteroid therapy any sensory disturbance in the trapezius area, those who had taken analgesic in the last 24 hours were excluded from the study.

SCREENING TOOL 1. Demographic data including name age, gender, number of hours of usage of smartphone and number of years of using smartphone 2. Smartphone Addiction Scale-Short Version (SAS-SV): The SAS-SV questionnaire (English version) is a tool for assessing smartphone addiction level. This 10-item self-reported scale addresses 5 content areas or domains, as follows: (i) daily-life disturbance, (ii) withdrawal, (iii) cyberspace-oriented relationships, (iv) overuse, and (v) tolerance. Participants respond on a 6-point Likert scale ranging from 1 ("strongly disagree") to 6 ("strongly agree") based on self-reporting. The total score in the SAS-SV is 60, with an average score of 30. It identifies the different range for males and females .For males a cut off value of 31 and for females cut off value of 33 was taken. [18]

III. OUTCOME MEASURES:

Visual Analogue Scale(VAS): Patients were asked to rate pain intensity by placing a mark on a 100- mm scale in which 1to 45mm denotes mild pain,46 to 75mm,denotes moderate pain and 76 to 100mm denotes severe pain .VAS is a highly reliable instrument for measuring pain [19,20]

Pain pressure threshold : It was measured by algometer. This method quantifies PPT. Pressure pain threshold was assessed at the angle of the upper fibres of the trapezius muscle (UFT, local) . Measuring pain pressure threshold (PPT) as an index of TrP sensitivity using pressure algometer is a reliable technique, demonstrate high interrater and intra rater reliability [21]

Craniovertebral Angle: The craniovertebral angle is measured by drawing a horizontal line starting from the spinous process of C7 and a diagonal line drawn through the tragus of the ear to the spinous process of C7.The craniovertebral angle was measured using the ON protractor app.The craniovertebral angle is formed at the point where these 2 lines met was recorded. The craniovertebral angle was measured using the ON protractor app. The landmarks (the tragus of the participants' ear and the 7th cervical vertebrae) were marked clearly with adhesive markers. 29. Participant were made to sit on a stool in an erect posture, hand by the side, they were asked to focus on a particular point with the neck in a neutral position, hip and knee in 90

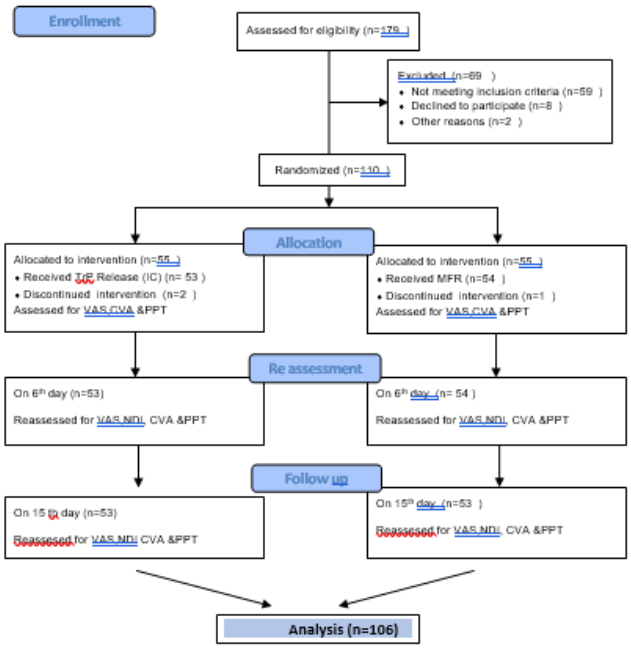
All Rights Reserved © 2021 IJSEM

ISSN (Online) 2456 -1304

International Journal of Science, Engineering and Management (IJSEM)
Vol 6, Issue 6, June 2021

degrees of flexion and foot rest on the floor. The tragus of the subject's ear was marked, and the seventh cervical vertebra was found and marked by finding its bony landmark. This was done by asking the subject to flex and extend her head 3 times, and then finding the seventh spinous process of the vertebra.[22]

The subjects were divided into two groups, Group A and Group B respectively, with 55 subjects in each, through randomisation using lottery method. The participants were single blinded of the treatment they received. Group A received trigger point release in the form of ischaemic compression and Group B received MRF. Both groups received Ultrasound therapy.VAS ,CVA and PPT were used as outcome measures. [23,24].



Fig/Table:1 Consort Flow Chart

Group A – Subjects were administered Trigger point release by Ischemic compression and were placed in supine position on the couch ,to reduce tension in the upper trapezius muscle the head was fully placed on the surface of the couch. Arm was positioned in slight shoulder abduction with the elbow bent and their hand resting on their stomach. Trigger point release to the upper trapezius was performed with the researcher standing at the head end of the couch. Using a pincer grasp the muscles was palpated over the fibres of the upper trapezius. To locate a trigger point, the muscle was palpated to feel for a taut band or a twitch response in the muscle belly. At approximately 1 to 2 inches medial to the acromion process of the scapula, the trigger points are commonly located which is in the middle of the muscle belly Once the trigger point was located, trigger point release by ischaemic compression was applied gradually by applying pressure to the trigger point with the index finger and thumb. In the case when more than one MTrP was detected, the most symptomatic was evaluated. The researcher was in communication with the patient, checking to ensure that the compression is within the limits of pain tolerance. The procedure was held for approximately 20 seconds to 60 seconds. The patient then informed the researcher about the decrease in pain, or until the muscle fibres begin to relax under pressure of the researcher. [25] Once the release was felt, the pressure was released gradually. Then effleurage strokes were done to flush out the area and followed with a passive stretch to the muscle. This was repeated for three to five times for six days.

Group B subjects received Myofascial release with the patient sitting on a chair and arms supported on thighs. The painful area was marked with a nontoxic marker. Forearm and/or ulnar border of the palm was used to apply pressure and glide medially towards the lower part of the neck and/ or towards the upper scapular region. As the glide was being given, the subject was asked to side bend the head to the opposite direction while sitting in an erect position. Myofascial release was given for 3-5 minutes which included 3 palmar glides [26] Ultrasound- It is a non-invasive method which consists of piezoelectric crystals that convert the electrical energy to mechanical oscillation energy using high-frequency alternating current. Therapeutic ultrasound: applied to the trapezius muscle was in the Pulse Mode-- 1.2 watts/cm^2.Treatment time- 5 mins, with 1 MHz, frequency and with patient in a seated position. [27,28] Stretching for the upper trapezius was taught as home program for both groups.

The VAS score, Craniovertebral angle was measured using ON protractor app,and the pain pressure threshold was measured using Baseline algometer. The baseline measurement. Post-test measurement was taken on the 6th day and the follow up measurement in the 15th day. On the last day of the treatment session, a handbook with the right ergonomic postures was given to the subjects.

IV. STATISTICAL ANALYSIS

The data were analyzed using IBM SPSS 20.0 statistical software to correlate smartphone addiction scale ,neck disability index VAS,CVA and PPT Spearman's correlation test was performed to analyse the relationship between them. Descriptive analysis such as mean, standard deviation was found for the scores of SAS-SV,VAS,CVA and PPT.

All Rights Reserved © 2021 IJSEM

ISSN (Online) 2456 -1304

International Journal of Science, Engineering and Management (IJSEM)
Vol 6, Issue 6, June 2021

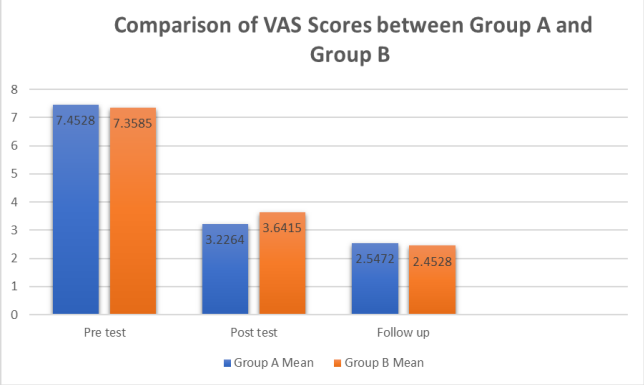
V. RESULTS

Results were analysed using SPSS software version 22.0 and Descriptive statistics mean (SD), were used to depict the profile of study population. Comparison within groups and between groups were done for VAS, CVA and PPT was done for the pre-test, post-test and follow up measurements using ANOVA.

The study comprised of 50(47%) male and 56(53%) in total. While group A had 25 male and 28 female, Group B too has the same number The mean age of the subjects in both the groups was 27.22 and 26.84, respectively. Both the techniques showed significant improvement in all the various parameters.

	Group A		Group B		P- Value
	Mean	**SD**	**Mean**	**SD**	
Pre test	7.4528	1.46190	7.3585	1.36007	.732
Post test	3.2264	1.04957	3.6415	1.07586	.047
Follow Up	2.5472	.74849	2.4528	.69520	.503

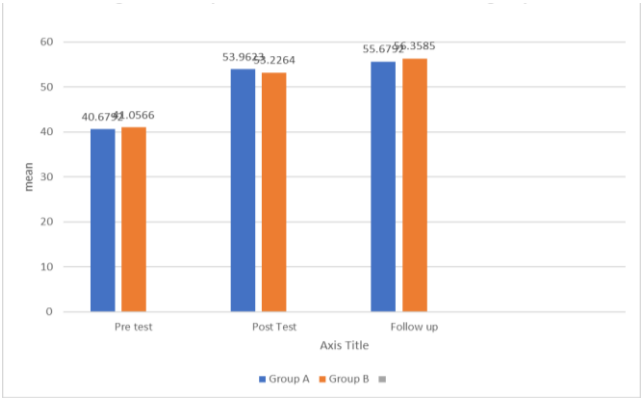
[Table/Fig-2]: Mean and Standard deviation of VAS for pre, post and follow up for group A and B and level of significance within and between groups



[Table/Fig-3]: Mean and Standard deviation of VAS for pre, post and follow up for group A and B and level of significance within and between groups

	Group A		Group B		P- Value
	Mean	**SD**	**Mean**	**SD**	
Pre test	40.6792	3.35567	41.0566	3.55406	.575
Post test	53.9623	2.48040	53.2264	2.49339	.131
Follow Up	55.6792	3.01135	56.3585	2.89625	.239

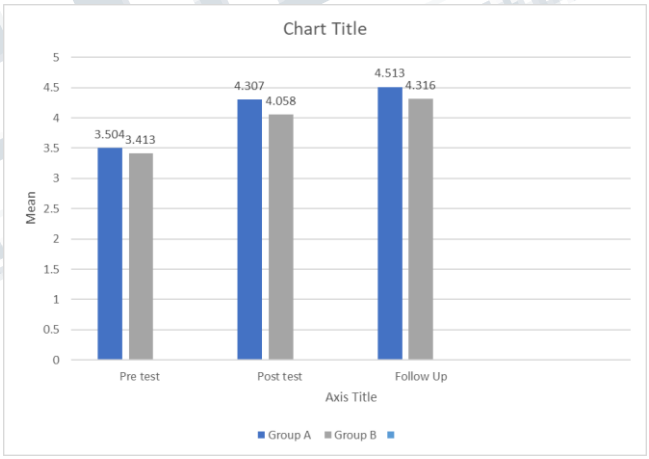
[Table/Fig-4]: Mean and Standard deviation of CVA for pre, post and follow up for group A and B and level of significance within and between groups.



[Table/Fig-No:5]: Mean and Standard deviation of CVA for pre, post and follow up for group A and B and level of significance within and between groups

	Group A		Group B		P- Value
	Mean	**SD**	**Mean**	**SD**	
Pre test	**3.504**	.072	**3.413**	**.074**	.000
Post test	**4.307**	.065	**4.058**	**.068**	.000
Follow Up	**4.513**	.071	4.316	**.084**	.000

[Table/Fig 6]: Mean and Standard deviation of PPT for pre, post and follow up for group A and B and level of significance within and between groups.



[Table/Fig 7]: Mean and Standard deviation of PPT for pre, post and follow up for group A and B and level of significance within and between groups.

VI. DISCUSSION

This was a comparative study to find the efficacy of TrP and MFR on myofascial trigger points of upper trapezius muscle in smartphone users. Both treatment techniques were found to be beneficial to participants. A follow up was done after 15 days. Ergonomic advice and a booklet were given to the subjects to follow.

Taut bands in the trapezius muscle are very common and as the muscle is a postural muscle it is susceptible to overuse.

All Rights Reserved © 2021 IJSEM

Trigger points are formed due to excess stress or strain over the trapezius muscle. While using a smartphone, the individual requires to flex the neck and look downwards which makes the head move forward and causes an excessive anterior curve in the lower cervical vertebrae and an excessive posterior curve in the upper thoracic vertebrae resulting in increased stress on the cervical spine and neck muscles. [29]

Any sort of muscle overuse or direct trauma to the muscle can lead to the development of TrPs. Muscle overload is thought to be the result of sustained or repetitive low-level muscle contractions, eccentric muscle contractions, and maximal or submaximal concentric muscle contractions. There may be a disruption of the cell membrane, damage to the sarcoplasmic reticulum with a subsequent release of high amounts of calcium-ions [30]

Many authors have proposed that trigger point release reduces the height of the sarcomeres and thus caused concomitant lengthening of the sarcomeres in the involved muscle fibres [24] There is an increase in blood flow to the affected area, when gentle forces is applied to the facial restricted area by MFR .This enhances lymphatic drainage of toxic metabolic wastes and realigns the facial planes, and resets the soft tissue proprioceptive sensory mechanism. This latter factor reprograms the central nervous system, enabling a normal functional range of motion without eliciting the old pain pattern [31]

Cellular metabolism remain increased within an active MTrP following trigger point release. Dialysate lactate, and dialysate glucose, concentration are increased in the MTrP in the 20 minutes following trigger point release. According to Simons integrated hypothesis of a TrP, the zone around a MTrP is in an ischemic state resulting in a shortage of glucose and oxygen for metabolism.[15] Post MTrP release the nutritive blood flow to the tissue is increased, and there is increased oxygen delivery to skeletal muscle to meet cellular energy demands required to regain homeostasis [32]

Hugh Gemmell et al, conducted a randomized single blind placebo-controlled trial to find the immediate effect of ischaemic compression and trigger point pressure release on neck pain and upper trapezius trigger points. trigger point release with sham ultrasound (SUS). He concluded that a single treatment with ischaemic compression to an active upper trapezius TrP was found to be superior to SUS [33]

Paul J et al., who compared the effect of MFR and deep transverse friction massage for upper trapezius trigger point, explained that MFR improves the vertical alignment and lengthens the body providing more space for proper functioning of osseous structures, nerves, muscles, blood vessels and organs which improves the function [26].

Barnes MF claimed that because of MFR, there is change in the viscosity of the ground substance of the muscle and fascia which can restore proper alignment of the muscle fibre and increase the joint mobility. He explained that MFR made the fascia elongated, softened and more pliable thereby, helping to restore the normal length of the fascia. Thus, it can be helpful to increase the flexibility and joint ROM [32,34] The resultant muscle relaxation may encourage a copious return of blood and oxygen, which dramatically elevates pain threshold and encourage healthy, compliant tissue. This promotes healing, reduces pain and pressure in the fibrous band of connective tissue or fascia by breaking up the adhesions.

This may be the first study which compares the effectiveness of these two techniques in pain, Craniovertebral angle due to trapezius spasm. In the present study both the techniques TrP release MFR were found to be effective. The techniques worked on the trigger point effectively. In TrP release the nutritive blood flow to the tissue is enabled, allowing for increased substrate perfusion and oxygen delivery to skeletal muscle to meet cellular energy demands required to regain homeostasis and in MFR the is change in the viscosity of the ground substance of the muscle and fascia which can restore proper alignment of the muscle fibre and increase the joint mobility. This in turn brings increased return of blood and oxygen, which elevates pain threshold and encourage healthy, compliant tissue thereby promoting healing reducing pain and breaking the adhesions. This result relieved the symptoms giving quick and long-lasting effect with regards to pain, mobility, and improvement of neck function. As a result, the scar tissue adhesions are broken and spasm is relieved due to shortening and lengthening of muscle thereby, giving quick and long-lasting effect with regards to pain, mobility, and improvement of neck function.

VII. LIMITATION

The limitation of the present study was that long term follow up was not taken to see the sustained effect of therapy.

VIII. CONCLUSION

Both manual Trigger point release and Myofascial release along with Ultrasound therapy was found to show better improvement in VAS score, pain pressure threshold and craniovertebral angle in subjects with trigger points of upper trapezius muscle who are smartphone addicts.

IX. ACKNOWLEDGEMENT

We sincerely acknowledge all the participants who volunteered for this interventional study.

All Rights Reserved © 2021 IJSEM

REFERENCES

[1] Desai MJ, Saini V, Saini S. Myofascial pain syndrome: a treatment review. *Pain Ther*. 2013;2(1):21-36. doi:10.1007/s40122-013-0006-y

[2] Marc S Micozzi, Fundamentals of Complementary and alternative, Elsevier Saunders 2015 286

[3] Stecco C, Macchi V, Porzionato A, Duparc F, De Caro R. The fascia: the forgotten structure. Ital J Anat Embryol. 2011;116(3):127-38.

[4] Cagnie B, Castelein B, Pollie F, Steelant L, Verhoeyen H, Cools A: Evidence for the use of ischemic compression and dry needling in the management of trigger points of the upper trapezius in patients with neck pain: a systematic review. Am J Phys Med RehabSil 2015;94:573

[5] Simons DG, Travell JG, Simons LS. Myofascial pain and dysfunction: the trigger point manual. Vol 1, upper half of body. 2nd ed. Baltimore: Williams & Wilkins; 1999.

[6] Langevin HM, Fox JR, Koptiuch C, Badger GJ, Greenan-Naumann AC, Bouffard NA, et al., Reduced thoracolumbar fascia shear strain in human chronic low back pain. BMC Musculoskeletal Disorders .2011, 12:203

[7] Ajimsha, M. S., Effectiveness of direct vs indirect technique myofascial release in the management of tension-type headache. Journal of bodywork and movement therapies, 2015 (4), 431-435.

[8] Day JA, Stecco C, Stecco A., Application of fascial manipulation technique in chronic shoulder pain anatomical basis and clinical implications. J Body Mov Ther.2009 13:128–35

[9] Ravish VN, Helen S. To compare the effectiveness of myofascial release technique versus positional release technique with laser in patients with unilateral trapezitis. Journal of Evolution of Medical and Dental Sciences. 2014;3(9):2161-67.

[10] Chaudhary ES, Shah N, Vyas N, Khuman R, Chavda D, Nambi G. Comparative study of myofascial release and cold pack in upper trapezius spasm. International Journal of Health Sciences and Research (IJHSR). 2013;3(12):20-27.

[11] Hermans V, Spaepen A. Perceived discomfort and electromyographic activity of the upper trapezius while working at a VDT station. International Journal of Occupational Safety and Ergonomics. 1995;1(3):208-14.

[12] de las Peñas CF, Campo MS, Carnero JF, Page JC. Manual therapies in myofascial trigger point treatment: A systematic review. Journal of Bodywork and Movement Therapies. 2005;9(1):27-34.

[13] Manheim CJ. The myofascial release manual. Slack Incorporated; 2008

[14] Kage V, Ratnam R. Immediate effect of active release technique versus mulligan bent leg raise in subjects with hamstring tightness: a randomized clinical trial. Int J Physiother Res. 2014;2(1):301-04.

[15] Hammer WI, editor. Functional soft-tissue examination and treatment by manual methods. Jones & Bartlett Learning; 2007.

[16] Altindag O, Ozaslan S. Efficacy of myofascial release method on pain and disease severity in patients with fibromyalgia. J Pain Relief. 2014;3:161.

[17] Sadria G, Hosseini M, Rezasoltani A, Bagheban AA, Davari A, Seifolahi A. A comparison of the effect of the active release and muscle energy techniques on the latent trigger points of the upper trapezius. Journal of Bodywork and Movement Therapies. 2017;21(4):920-25

[18] Ammati R, Kakunje A, Karkal R, Nafisa D, Kini G, Chandrashekaran P. Smartphone Addiction among Students of Medical University in South India: A Cross-Sectional Study. Ann. Int. Med. Den. Res. 2018; 4(2):PY01-PY04.

[19] Ajimsha et al., 2013) Ajimsha, M.S., Al-Mudahka, N.R., Al-Madzhar, J., Effectiveness of myofascial release: systematic review of randomized controlled trials, Journal of Bodywork & Movement Therapies (2014), doi: 10.1016/j.jbmt.2014.06.001

[20] Boonstra AM, Schiphorst Preuper HR, Reneman MF, Posthumus JB, Stewart RE. Reliability and validity of the visual analogue scale for disability in patients with chronic musculoskeletal pain. Int J Rehabil Res. 2008 Jun;31(2):165-9. doi: 10.1097/MRR.0b013e3282fc0f93. PMID: 18467932.

[21] Stuart Cathcart, BA Hons et al, Reliability of pain Threshold Measurement in young adults: The internet Journal of pain, Symptom control and palliative care, 2005,4.

[22] Akodu AK, Akinbo SR, Young QO.Correlation among smartphone addiction, cranioverte-bral angle, scapular dyskinesis, and selected anthropo-metric variables in physiotherapy undergraduates.J Taibah Univ Med Sc 2018;13(6):528e534.

[23] Shin YJ, Kim WH, Kim SG. Correlations among visual analogue scale, neck disability index, shoulder joint range of motion, and muscle strength in young women with forward head posture. Journal of Exercise Rehabilitation. 2017;13(4):413.

[24] Travell JG, Simons DG. Myofascial pain and dysfunction: the trigger point manual. Lippincott Williams & Wilkins; 1983.

[25] amwongsa S, Puntumetakul R, Neubert MS, Boucaut R. Factors associated with neck disorders among university student smartphone users. Work. 2018;61(3):367-378. doi: 10.3233/WOR-182819. PMID: 30373996

All Rights Reserved © 2021 IJSEM

[26] Nambi GS, Sharma R, Inbasekaran D, Vaghesiya A, Bhatt U. Difference in effect between ischemic compression and muscle energy technique on upper trepezius myofascial trigger points: Comparative study. Int J Health Allied Sci 2013;2:17-22

[27] Snehal Desai and Dr. Kiran Jeswani. To compare the effect of myofascial release and ischaemic compression on pain, cervical lateral flexion and function in acute Trapezitis in young adults. IJAR,2018; 4(3): 448-454.

[28] Lukas D. Linde MSc Dinesh A. Kumbhare MD, MSc, FRCPC Maneil Joshi BSc John Z. Srbely DC, PhD Lukas D. Linde MSc The Relationship between Rate of Algometer Application and Pain Pressure Threshold in the Assessment of Myofascial Trigger Point Sensitivity. Pain Practice, Volume 18, Issue 2, 2018 224–229

[29] Fernández-de-las Penãs C, et al: The immediate effect of ischemic compression technique and transverse friction massage on tenderness of active and latent myofascial trigger points: a pilot study, J Bodyw Mov Ther 10:3-9, 2006

[30] Moraska AF, Hickner RC, Kohrt WM, Brewer A. Changes in blood flow and cellular metabolism at a myofascial trigger point with trigger point release (ischemic compression): a proof-of-principle pilot study. *Arch Phys Med Rehabil*. 2013;94(1):196-200. doi:10.1016/j.apmr.2012.08.216

[31] Vásquez B, Navarrete J, Farfán E, Cantín M. Effect of pulsed and continuous therapeutic ultrasound on healthy skeletal muscle in rats. Int J Clin Exp Pathol. 2014;7(2):779-783. Published 2014 Jan 15.

[32] Barnes MF. The basic science of myofascial release: morphologic change in connective tissue. Journal of Bodywork and Movement Therapies. 1997;1(4):231-38

[33] Gemmell, Hugh & Miller, Peter & Nordstrom, Henrik. (2008). Immediate effect of ischaemic compression and trigger point pressure release on neck pain and upper trapezius trigger points: A randomised controlled trial. Clinical Chiropractic. 11. 30-36. 10.1016/j.clch.2007.09.001.

[34] Paul J, Kumar M. A comparative study on the effect of Myofascial Release versus Deep Transverse Friction on myofascial trigger points of upper back. International Journal of Medical.

All Rights Reserved © 2021 IJSEM