ORIGINAL ARTICLE

VIMSJPT

# EFFECT OF STATIC STRETCHING VERSUS DYNAMIC STRETCHING ON EXTENSIBILITY OF TRAPEZIUS MUSCLE IN PATIENTS WITH CHRONIC NECK PAIN

**[1]Anuradha Venkat, [2]Supriya Dhumale**

1.Bachelors of Physiotherapy Student. 2. Assistant Professor., K.J Somaiya College of Physiotherapy, Sion, Mumbai.

**ABSTRACT:**

***BACKGROUND:*** Neck pain is the most common problem in adults and a common musculoskeletal problem in people with sedentary jobs. In chronic neck pain, the upper trapezius muscle is the most common muscle to be shortened, with a typical complaint of reduction in the lateral range of motion. Passive tension of the upper trapezius must be reduced to decrease the load on the cervical spine, improve neck motion and reduce painful neck movements. One recommended way to reduce this tension is by stretching to relieve neck pain, reducing the pressure pain threshold of the upper trapezius and increasing neck mobility. There are various studies comparing the effectiveness of static and dynamic stretching on muscle extensibility but none for trapezius muscle. The aim is to study the effect of static stretching versus dynamic stretching on trapezius muscle extensibility in patients with chronic neck pain.

***METHODS:*** 74 Patients with moderate to severe neck pain for a duration of 7 months or more were included in the study. They were informed about the study and written consent was obtained. They were divided into two groups: Group A –Static stretching (SS) and Group B – Dynamic stretching (DS). Duration of treatment was for 6 days (6sessions). Outcome measures at the start on the first day (pre) and after 6 days (post) treatment were documented.

***RESULTS:*** Both Group A and Group B showed statistically significant results in post-treatment.

***CONCLUSION:*** Static stretching and dynamic stretching were found to be equally effective in the pain relief and improvement in range of motion in chronic neck pain patients.

***KEYWORDS :*** Chronic neck pain, dynamic stretching, static stretching, trapezius extensibility.

Received 21nd June 2019, Accepted 28th June 2019, Published 30h June 2019



**CORRESPONDING AUTHOR**

**SUPRIYA DHUMALE**

Assistant Professor

K.J Somaiya College of Physiotherapy, Somaiya Ayurvihar, Eastern Express Highway, Sion, Mumbai, Maharashtra, India. 400022

**Email:** supriyadhumale@hotmail.com

**Mob.** (+91) 9619320011

## INTRODUCTION

Pain is an "unpleasant sensory and emotional experience associated with actual or potential tissue damage".[1]

Chronic neck pain is a widespread sensation with hyperalgesia in the skin, ligaments, and muscles on palpation and in both passive and active movements in the neck and shoulder area.[2]

Another type of classification according to the "Indian Association of the Study of Pain ( IASP)" is that acute neck pain usually lasts less than 7 days, subacute neck pain lasts more than 7 days but less than 3 months, and chronic neck pain has a duration of 3 months or more.[3]

Neck pain is the most common problem in adults and is the most common musculoskeletal problem in people with sedentary jobs. There are various reasons for chronic neck pain –poor posture, anxiety etc. In chronic neck pain, the upper trapezius muscle is the most common muscle to be shortened, with a typical complaint of reduction in the lateral range of motion. [4]The prevalence of neck pain is observed to be 0.4% to 86.8% general population(2010), the prevalence of neck pain was 20.3 %, with a greater prevalence observed in the working middle age.[4] Neck pain presents with different signs and symptoms, including decreased range of motion (ROM), paresthesia, upper extremity weakness, and headaches.[5]

The trapezius muscle is one of the largest muscles of the neck and upper back. It has a shape like that of the trapezium. It consists of three fibers; upper, middle and lower fibers. The upper trapezius elevates and rotates the scapula upward, when it acts unilaterally it causes ipsilateral cervical flexion and cervical rotation to the opposite side and when it acts bilaterally it causes cervical extension. In chronic neck pain, the upper trapezius (UT) muscle is the most common muscle to be shortened, with a typical complaint of a decrease in the lateral flexion range of motion with rotation.[6] Passive tension of the UT needs to be reduced to decrease the load on the cervical spine, improve neck motion and reduce painful neck movements. One recommended way to reduce this tension is by stretching to relieve neck pain, reducing the pressure pain threshold of the upper trapezius and increasing neck mobility.[7]

Stretching is a general term used to describe any therapeutic manoeuvre designed to increase the extensibility of soft tissues, thereby improving the flexibility by elongating structures that have adaptively shortened and have become hypomobile over time.[8]A variety of stretching methods have been presented in the literature to increase muscle flexibility - static stretching, dynamic stretching, ballistic stretching and stretching based on the principles of PNF. The stretching techniques commonly used are static and dynamic stretching.

### Static stretching

Static stretching is a commonly used method of stretching in which soft tissues are elongated just pass the point of tissue resistance and then held in the lengthened position with a sustained stretch force over a period of time.[8]

According to **Bandy and Irion**[9]and **Bandy et al**[10], the optimal time a stretch should be held is 30 seconds one time per day. Benefits of this slower stretching technique include that the stretch prevents the tissue from having to absorb great amounts of energy per unit time, the slow stretch will not elicit a forceful reflex contraction, and this technique alleviates muscle soreness.

The goal of stretching according to Encyclopedia of Sports Medicine is to "desensitize tension sensors in the muscle", and it is believed that when this happens the muscle capacity of taking on more force increases before becoming damaged.[11]

### Dynamic stretching

**Murphy(1991)** argued that the nature of static stretching is passive and does nothing to warm a muscle. According to Murphy, an activity that is more dynamic in nature may help in warming the muscle thereby increasing the flexibility.[12]

Another form of stretching is dynamic stretching. It can be divided into active dynamic stretching or dynamic range of motion (DROM) and ballistic dynamic stretching. Active stretching generally involves moving a limb through its full range up to the end range and repeating several times. During a dynamic range of motion, a contraction by the antagonist muscle causes the joint crossed by the agonist

(lengthening muscle) to move through the full range of motion at a controlled, slow tempo. This contraction by the antagonist causes the lengthening muscle to relax due to the principle of reciprocal inhibition. Therefore, the dynamic range of motion is a more natural way to elongate the muscle and does so in a relaxed state, since the muscle is reflexively inhibited.[13,14] Murphy [14] also suggests that strength is promoted because the movement is being performed by the muscles that actively move the involved joint.Pain can also be reduced using heating modalities. There are two –superficial heating modalities- heating and cooling. According to a comparative study performed by **Ravindra Boddeti , V. SrikanthBabu , A.J Oliver Raj**[15] it was concluded that the superficial heating modality followed by stretching will increase the greater extent of the range of motion, reduce pain, as well as increase the flexibility of muscle.There are various studies comparing the effectiveness of static and dynamic stretching on muscle extensibility but very few for trapezius muscle hence this study aims to compare the effects of static stretching versus dynamic stretching on the extensibility of trapezius muscle in patients with chronic neck pain.

## METHODS

### SELECTION OF PARTICIPANTS-

The participants in the study are patients with chronic neck pain, defined as the pain in the cervical region existing for 3 or more than 3 months. The neck pain may radiate to the shoulder region or the upper extremities, or be accompanied by headache, but the main complaint must concern the neck. The inclusion criteria are: chronic neck pain ≥ 3 months, both genders, age between 20 - 40 years. Any history of injury to the spinal cord eg. Tetraplegia, Spina bifida etc, any cervical surgery eg. Any decompression surgery, fractures etc, Vertebra-basilar symptoms eg. Giddiness and vomiting etc, any musculoskeletal injury of the upper extremity of duration less than one year eg , any upper limb fractures, strains etc, patients diagnosed with conditions such as cervical prolapsed intervertebral disc, thoracic outlet syndrome etc, are excluded in this. During the consultation, these criteria study are assessed and the patient is informed about the study. Patients who are eligible and agree to participate are asked to sign the informed consent form and reassured for their safety during the procedures and informed that any harm incurred during the study would be taken care of. However, no harm was incurred to the patients during the study. Baseline measurement i.e active neck range of motion using universal goniometer, numerical pain rating scale, neck disability index is performed.

### RANDOMIZATION

After the baseline measurement, the patients are randomly assigned using computer-generated random allocation either to the static stretching group or to the dynamic stretching group. The two groups received the selected intervention for 6 days.

### INTERVENTION

Conventional therapy consisting of hot pack application for 10 minutes for pain relief was given to both the groups before intervention.

Group A –Static stretching technique (n=15)

Patient position-When performing the trapezius stretching the individual is positioned in sitting with back erect.

Procedure-The evaluator passively performs cervical side flexion and continues to increase the range by stretching the trapezius and continues to perform stretching until stretch pain is felt as shown in (Figure 1).

The duration-this position is held for 30 sec and 3 sets were performed bilaterally.[11,12]

**Fig 1:** Static Stretching

**Fig. 2:** Dynamic Stretching

Group B-dynamic stretching –(n=15)

The patient position-The patient is positioned in sitting with back erect and the left arm behind the back. Procedure- the patient actively laterally flexes the head to the right and rotates the head slightly to the left till a stretch

pain if felt, as shown in (FIGURE 2). This position is held for 10 seconds. This same method is repeated for the right side.

Duration-The stretching is done for 9 times on both sides.

The following exercises are performed by both the groups after the stretching protocol-

1. Chin tucks -10 times as shown in FIGURE 3.

2.Shoulder retractions with the elbow in 90-degree flexion along with chin tuck.-10 times as shown in FIGURE 4

3.Active movements in flexion, extension, lateral flexion to right and then to left, rotations to right and then to left.- 10 times each as shown in FIGURE 5.

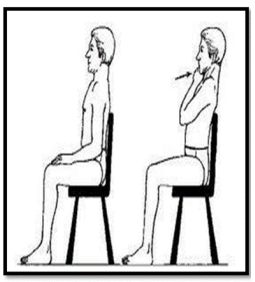

**Fig. 3:** Chin tucks

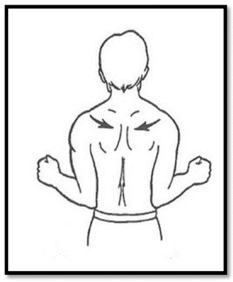

**Fig. 4:** Shoulder Retraction

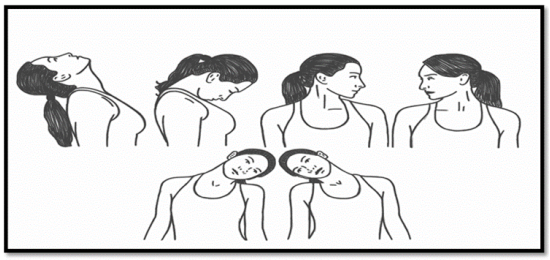

**Fig. 5:** Active movements of Neck

## STATISTICAL ANALYSIS

The baseline scores of the patients (PAIN, ROM and NDI), outcome measures were used to compare the two intervention groups. Difference between baseline and after 6 days' intervention will be calculated and compared between the two intervention groups. Statistical analysis has been carried out to analyze the significant impact of the treatments issued to the subjects of both groups by using statistic software Graph Pad Instat 3.0 Version. The 30 patients, 15 were randomized into the control group and 15 were randomized into the experimental group. All of them completed the entire protocol as defined by 6 days' intervention, the outcome of the study were NPRS, ROM, NDI. Descriptive analysis of numerical data was expressed in mean and standard deviation for various parameters. Normality was assessed using Kolmogorav-Smirnov test. Parametric tests were used wherever data passed the test for normality. Non – parametric tests were used wherever data did not pass normality. Within – group analysis- Paired t-test and Wilcoxin Signed Rank test were used for comparison within the groups. Between the group, analysis-Unpaired t-test and Mann Whitney test were used to compare between the groups. A p-value less than 0.05 was considered statistically significant. The data of the study was quantitative and continuous in nature hence graphical representation was done using box plots.

## RESULTS

The study was conducted on Group A (static stretching), Group B (dynamic stretching) for a duration of 6 days.

Statistically significant pain relief (as measured by NPRS), increase in cervical ROM and improvement in disability (as measured by NDI) pre and post-intervention in Group A and Group B was observed ($p<0.05$) as shown in Table1.

**Table 1:** Mean , Standard deviation and p values in Group A and Group B pre and post-intervention

| | Static Stretching(n=15) Mean (SD) | | | Dynamic Stretching(n=15) Mean (SD) | | |
|---|---|---|---|---|---|---|
| | **Pre- treatment** | **Post- treatment** | **p value** | **Pre- treatment** | **Post- treatment** | **p value** |
| Pain (NPRS) | 5.53( 0.74) | 0.8(0.67) | <0.0001* | 5.7(1.46) | 5.7(0.88) | <0.0001* |
| Cervical ROM($^0$) | | | | | | |
| Flexion | 40.066.28) | 46.8(4.82) | 0.0003* | 36.207.97) | 44.806.79) | <0.0001* |
| Extension | 45.20(7.97) | 56.80(7.21) | <0.0001* | 42.20(8.16) | 53.20(8.57) | 0.0105* |
| Rt Lateral Flexion | 32.46(6.46) | 38.53(5.02) | <0.0001* | 33.13(4.61) | 39.93(2.89) | <0.0001* |
| Lt Lateral Flexion | 31.26(5.35) | 37.40(5.09) | <0.0001* | 33.40(3.29) | 39.40(3.29) | 0.0233* |
| Rt Rotation | 65.53(9.85) | 72.26(9.24) | 0.0002* | 64.66(10.94) | 72.20(11.10) | <0.0001* |
| Lt Rotation | 63.73(11.15) | 73.00(9.17) | 0.0001* | 60.8(15.00) | 69.33(14.25) | <0.0001* |
| Neck Disability Index | 25.47(9.34) | 6.06(2.44) | <0.0001* | 18.36(6.77) | 8.24(2.84) | <0.0001* |

Whereas no statistical significance was observed when Group A and Group B were compared.

Group A and Group B -within-group comparison showed significant improvement ($p<0.05$) in the three outcome measure- NPRS, CERVICAL ROM-flexion, extension, lateral flexion (right and left), rotation (right and left) and NDI as shown in Table 1.

Between-group- there was no statistical significance ($p<0.05$) observed in NPRS, CERVICAL ROM- flexion, extension, lateral flexion (right and left), rotation (right and left) and NDI between group A and group B as shown in Table 2 and Figure 6-13

**Table 2:** Mean, Standard deviation and p values in Group A and Group B.

| | Static Stretching (n=15) Mean (SD) | P value | Dynamic Stretching (n=15) Mean (SD) | P value |
|---|---|---|---|---|
| Pain(NPRS) | 0.80(0.67) | 0.5855** | 0.70(0.88) | 0.5855** |
| Cervical ROM($^0$) | | | | |
| Flexion | 46.80(4.82) | 0.5326** | 44.80(6.79) | 0.5326** |
| Extension | 56.80(7.21) | 0.5249** | 53.20(8.57) | 0.5249** |
| RT Lateral Flexion | 38.53(5.02) | 0.5734** | 39.93(2.89) | 0.5734** |
| LT Lateral Flexion | 37.40(5.09) | 0.3593** | 38.40(3.29) | 0.3593** |
| RtRotation | 72.26(9.24) | 0.5020** | 72.20(11.10) | 0.5020** |
| Lt Rotation | 73.00(9.17) | 0.1105** | 69.33(14.25) | 0.1105** |
| Neck Disability Index | 6.06(2.44) | 0.5753** | 8.24(2.84) | 0.5753** |

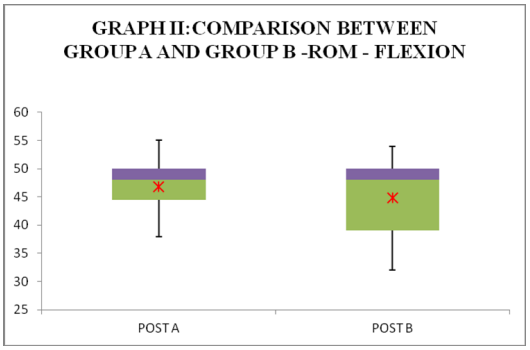


**Fig 6**: Comparison between Group A and B– ROM Flexion

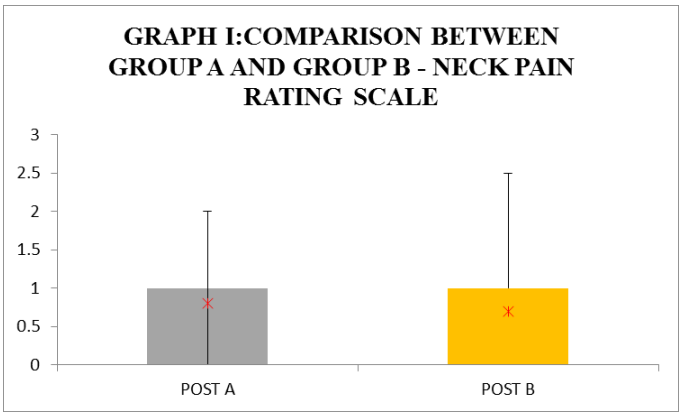


**Fig 7**: Comparison between Group A and B– Neck pain rating Scale

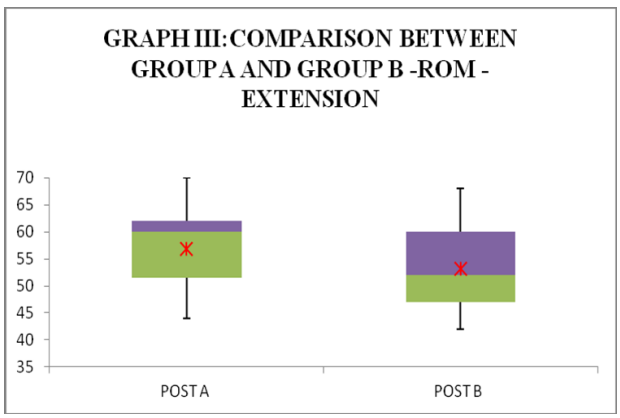


**Fig 8:** Comparison between Group A and B– ROM Extension

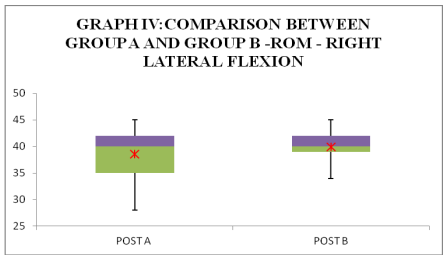


**Fig 9:** Comparison between Group A and B– Right Lat. Flexion

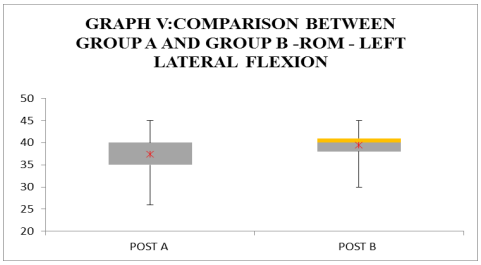


**Fig 10**: Comparison between Group A and B– ROM Left Lat. Flexion

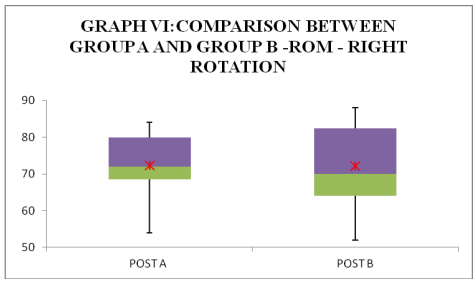


**Fig 11:** Comparison between Group A and B– ROM Right Rotation

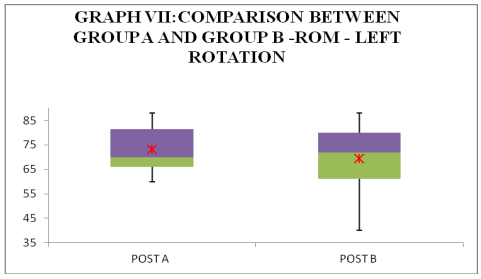


**Fig 12**:Comparison between Group A and B– ROM Left Rotation

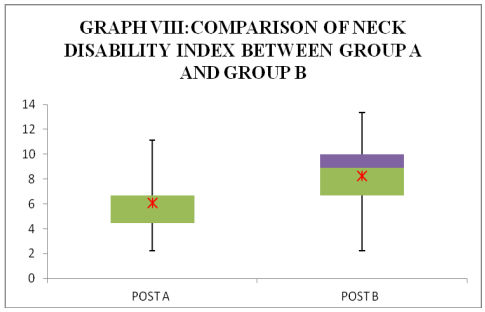


**Fig 13:** Comparison of NDI between Group A and B

## DISCUSSION

The study aimed to compare the effect of static stretching versus dynamic stretching on the extensibility of trapezius muscle in patients with chronic neck pain. Thirty patients ranging from 20- 40 years of age ( group A-30.26±7.732 ; group B -30.46±7.732)with neck pain anywhere between occiput –T1 and B/L upper trapezius muscle for more than 3 months were divided randomly using computer-generated random allocation into two groups.

Group A (n=15) consisted of 12 females and 3 males (90% females and 20 % males) on whom static stretching was performed.

Group B (n=15) consisted of 14 females and 1 male (93.33% females and 6.66% males) on whom dynamic stretching was performed.

The treatment was given for 6 days.Both the groups were given conventional therapy in the form of hot packs (10 minutes) in accordance with the study conducted by Ravindra Kumar Boddeti.[15]Three outcome measures were assessed – neck pain rating scale(NPRS) , ROM –flexion, extension, left lateral flexion (LLF), right lateral flexion (RLF), left rotation (LR), right rotation (RR) and neck disability index(NDI) as a measure of functional disability.

Group A-within group comparison showed significant improvement in the three outcome measure- NPRS, ROM and NDI.

Group B- within-group comparison showed significant improvement in the three outcome measure- NPRS, ROM and NDI.

Between-group- there was no statistical significance observed in NPRS, ROM and NDI between group A and group B.

Based on previous studies, thermal agents applied prior to or during the stretching procedure**. Nakone et al , 2012** showed greater effectiveness in pain reduction and an increase in muscle extensibility. This could be attributed to the physiological effects of heating by which there is an increase in muscle temperature, an increase in blood supply and reduction in spasm.[16]

The impact of stretching on flexibility improvements has been widely investigated. The increased Range of motion is associated with flexibility gains, which in turn, are linked to pain tolerance, muscle tendon viscoelastic properties and increased number of sarcomeres in series.[17-20]

Static stretching creates an acute increase in joint range of motion that tends to persist for 60 to 90 minutes (Moeller et al., 1985; Kirsch et al., 1995; Zito et al., 1997).[21]Much of this short-term increase in static flexibility is related to an increase in stretch tolerance (Wiemann and Hahn, 1997; Magnusson, 1998).[22] In other words, the increased range of motion may be related to an analgesic effect that allows the person to tolerate higher levels of passive tension required to stretch the muscle farther than it was before. Stretch tolerance has also been observed to be higher in flexible persons than "tight" persons, so greater range of motion in most persons is achieved with higher passive tensions (Magnusson et al., 2000a).[23]

The Golgi Tendon Organ (GTO) is a sensory organ located near the musculotendinous junction of extrafusal muscle fibres. The function of a GTO is to monitor changes in tension of muscle-tendon units. It is thought that when a low intensity, slow stretch force is applied to the muscle, the stretch reflex is likely to be activated as the GTO fires and inhibits alpha motor neuron activity , and decrease the tension in the muscle-tendon unit being stretched , allowing the parallel elastic component(the sarcomere) of the muscle to remain relaxed .

This relaxation of the muscle, increased range of motion, reduced functional disability and reduced pain results in perceived wellbeing and improved quality of life.[6]

The improvement in group B could be attributed to a relatively newer method to lengthen muscle called dynamic stretching.

During dynamic stretching (DROM) a contraction by the antagonist muscle causes the joint crossed by the agonist (lengthening muscle) to move through the full ROM at a controlled slow tempo. All movements are performed slowly and deliberately. If performed too quickly, a tendency to swing the extremity exits, causing the stretch reflex to be elicited at the endpoint of the movement in the lengthening muscle. The dynamic range of motion begins from a neutral position, followed by a slow movement (4-5 seconds) of the limb to end range, a brief hold at end range (4-5 seconds), and, finally, slowly (4-5 seconds) moving the limb back to the original neutral position using an eccentric contraction. Murphy speculates that this contraction by the antagonist causes the lengthening muscle to relax due to the principle of reciprocal inhibition. Therefore, DROM is a more natural way to elongate the muscle and does so in a relaxed state, since the muscle is reflexively inhibited. Murphy also suggests that strength is promoted because the movement is being performed by the muscles that actively move the involved joint. [13,14]

The result for between-group improvement in ROM, NPRS and functional disability is considered not significant.

According to studies conducted by McHugh MP, Magnusson SP, Gleim GW, Nicholas JA.; and Bandy WD, Irion JM. Static stretching is effective at increasing ROM. The greatest change in ROM with a static stretch occurs between 15 and 30 seconds.

And according to studies conducted by de Weijer VC, Gorniak GC, Shamus E. and Beedle BB, Mann CL Both static and dynamic stretching appear equally effective at improving ROM acutely or over time with training. Several authors have found no improvement in performance when comparing static and dynamic stretching.[24-28]

Static stretching has been shown to be more effective than dynamic stretching for those recovering from hamstring strains.[29]

Researchers have shown that 12 months of stretching is as effective as strengthening exercises or manual therapy in patients with chronic neck pain.30,31 In addition, patients with chronic musculoskeletal pain demonstrate an increased tolerance to stretch after 3 weeks of static stretching.[32] Lewit and Simons[33]reported an immediate 94% reduction in pain associated with trigger points after applying a PIR technique. These studies support stretching in pain management programs.

## CONCLUSION

According to the study, it can be concluded that both static stretching and dynamic stretching are effective in increasing trapezius extensibility in patients with chronic neck pain. Application of hot pack for 10 minutes prior to treatment increased effectiveness of the method.

There was equal effectiveness when static stretching was compared to dynamic stretching in patients with chronic neck pain.

## CLINICAL APPLICATION

To improve muscle extensibility in the upper trapezius muscle, reduce pain and improve functional ability either static stretching or dynamic stretching of upper trapezius can be used since both are equally effective in patients with chronic neck pain.

## REFERENCES


1. Merskey H, Bogduk N, editors. Classification of chronic pain. 2nd ed. Seattle: IASP Task Force on Taxonomy.1994.

2. Ylinen J. Physical exercises and functional rehabilitation for the management of chronic neck pain. Europa Medicophysica. 2007;43:119-132.

3. Merskey H, Bogduk N. Classification of chronic pain. 2nd ed. Seattle: IASP Press, 1994. p. 1

4. Hoy DG, Protani M, De R, Buchbinder R. The epidemiology of neck pain. Best Practice and Research Clinical Rheumatology 2010; 24(6):783–792.

5. Borg-Stein J, Simons DG. Focused review: Myofascial pain. Archives of Physical Medicine and Rehabilitation. 2002; 83(3 Suppl 1):S40-47, S48-49.

6. Carolyn Kisner, Lynn Allen Colby. Therapeutic exercises, Foundation and Technique; 4 th edition .

7. Ylinen J, Kautiainen H, Wirén K, Häkkinen A. Stretching exercises vs manual therapy in treatment of chronic neck pain: a randomized, controlled cross-over trial. Journal of Rehabilitation Medicine .2007; 39(2):126-132

8. Carolyn Kisner , Lynn Allen Colby, Chapter 4, Stretching for impaired Mobility , In: Therapeutic Exercise Foundations and Techniques. Sixth Edition. F.A. Davis Company; 2012.p, 73-113

9. Bandy W, lrion J: The effect of time on static stretch on the flexibility of the hamstring muscles. Physical Therapy .1994; 74:845- 850.

10. Bandy W, Irion J, Briggler M: The effect of time and frequency of static stretch on flexibility of the hamstring muscles. Physical Therapy. 1997;77:1090- 1096.

11.Okragly, R. A. Static Stretching. Encyclopedia of sports medicine.2011;4:1397-1398

12.Russell T. Nelson. A Comparison of the Immediate Effects of Eccentric Training vs Static Stretch on Hamstring Flexibility in High School and College Athletes. North American Journal of Sports Physical Therapy. May 2006;1(2):56-61.

13. Murphy DR.A critical look at static stretching: Are we doing our patients harm? Chiropractic Sports Medicine. 1994 (10); 967- 970

14. Murphy DR. Dynamic range of motion training: An alternative to static stretching. Chiropractic sports medicine. 1994;8:59.

15. Ravindra kumar Boddeti, V.Thirupathi Rao , V. Srikanth Babu , A. J. Oliver Raj.A comparative study on the effects of superficial heating and cooling application over the hamstring prior to stretching in normal individuals .International Journal of Physiotherapy and Research. 2013, 01:02-08.

16. Nakano J, Yamabayashi C, Scott A, Reid WD. The effect of heat applied with stretch to increase range of motion: a systematic review. Physical Therapy in Sport. 2012; 13 (3):180-188.

17. Ylinen J, Kankainen T, Kautiainen H, Rezasoltani A, Kuukkanen T, Hakkinen A. Effect of stretching on hamstring muscle compliance. Journal of Rehabilitation Medicine. Jan 2009;41(1):80-84.

18. Halbertsma JP, Goeken LN. Stretching exercises: effect on passive extensibility and stiffness in short hamstrings of healthy subjects. Archives of Physical Medicine and Rehabilitation . Sep 1994;75(9):976-981.

19. Ben M, Harvey LA. Regular stretch does not increase muscle extensibility: a randomized controlled trial. Scandinavian journal of medicine & science in sports. Feb 2010;20(1):136-144.

20. Law RY, Harvey LA, Nicholas MK, Tonkin L, De Sousa M, Finniss DG. Stretch exercises increase tolerance to stretch in patients with chronic musculoskeletal pain: a randomized controlled trial. Physical Therapy. Oct 2009;89 (10):1016-1026.

21.Möller M, Ekstrand J, Öberg B, Gillquist J. Duration of stretching effect on range of motion in lower extremities. Archives of physical Medicine and Rehabilitation. 1985 Mar 1;66(3):171-3.

22. Wiemann and Hahn, Magnusson. The Biomechanics of Stretching. Journal of Exercise Science & Physiotherapy .2006:2: 3-12.

23. Knudson D. The biomechanics of stretching. Journal of Exercise Science and Physiotherapy. 2006;2:3.

24. Young W, Clothier P, Otago L, Bruce L, Liddell D. The Biomechanics of Stretching. Journal of Exercise Science & Physiotherapy .2006;2: 3-12

25.Wallmann HW, Mercer JA, Landers MR. Surface electromyographic assessment of the effect of dynamic activity and dynamic activity with static stretching of the gastrocnemius on vertical jump performance. Journal of Strength and Conditioning Research. May 2008;22(3):787-793.

26. McMillian DJ, Moore JH, Hatler BS, Taylor DC. Dynamic vs. static-stretching warm up: the effect on power and agility performance. Journal of Strength Conditioning and Research. Aug 2006;20(3):492-499.

27. Dalrymple KJ, Davis SE, Dwyer GB, Moir GL. Effect of static and dynamic stretching on vertical jump performance in collegiate women volleyball players. Journal of Strength Conditioning and Research. Jan 2010;24(1):149-155.

28. Torres EM, Kraemer WJ, Vingren JL, et al. Effects of stretching on upper-body muscular performance. Journal of Strength Conditioning and Research. Jul 2008;22 (4):1279-1285.

29. O'Sullivan K, Murray E, Sainsbury D. The effect of warm -up, static stretching and dynamic stretching on hamstring flexibility in previously injured subjects. *BMC Musculoskeletal Disorders*. 2009;10:37.

30. Hakkinen A, Kautiainen H, Hannonen P, Ylinen J. Strength training and stretching versus stretching only in the treatment of patients with chronic neck pain: a randomized one-year follow-up study. Clinical Rehabilitation. Jul 2008;22(7):592-600.

31. Ylinen J, Kautiainen H, Wiren K, Hakkinen A. Stretching exercises vs manual therapy in treatment of chronic neck pain: a randomized, controlled cross-over trial. Journal of Rehabilitation Medicine. Mar 2007;39(2):126-132.

32. Law RY, Harvey LA, Nicholas MK, Tonkin L, De Sousa M, Finniss DG. Stretch exercises increase tolerance to stretch in patients with chronic musculoskeletal pain: a randomized controlled trial. Physical Therapy. Oct 2009;89 (10):1016-1026.

33. Lewit K, Simons DG. Myofascial pain: relief by postisometric relaxation. Archives of Physical Medicine and Rehabilitation.Aug 1984;65(8):452-456.

**How to cite this article:** Anuradha Venkat, Supriya Dhumale. **Effect of static stretching versus dynamic stretching on extensibility of trapezius muscle in patients with chronic neck pain.**VIMSJPT .2019;1(1):10-18