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Compare The Effects Of Manual Therapy And Pnf Stretching Exercises In Under-Graudate Students Having Mechanical Neck Pain

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Abstract: -

Context: - Neck pain is a common problem among population. It can occur at any phase of their lives. Cervicalgia is another name of neck pain. Tightness of cervical muscles and upper back, muscles or compression of the nerves can cause neck pain that radiate from vertebrae in cervical region.

Aims: - To evaluate the effectiveness of MANUAL THERAPY and PNF Stretching Exercises in reducing pain and improving functional disability in students suffering from mechanical neck pain.

Study design: - Experimental study (Pre-test, post-test matched pair design)

Setting: - Outpatient Physiotherapy clinic.

Material and Methodology: - The study had pre – test, post-test experimental group design. There are two group each having 15 subjects. Group A included 15 patients who were treated hot packs, PNF stretching and neck isometrics. Group B included 15 patients who were treated with hot packs, Manual therapy and Neck isometrics.

Statistical analysis: The data analyzed using SPSS 21.0. Software package and statistical test used is paired t-Test to compare the effectiveness of associated functional disability. A significant value of $P < 0.05$ was set.

Results: Based on the mean scores and their differences, both PNF stretching exercises (Group-A) and Manual therapy (Group-B) are statistically significant in reducing mechanical neck pain and improving functional disability among undergraduate students (greater than $P<0.05\%$ level)

Conclusion: It has been concluded that PNF Stretching exercises is better than manual therapy in reducing and improving neck pain and functional disability of the students.

Key words: - Pain, PNF, Manual Therapy, Neck Disability Index, NPRS.

INTRODUCTION:

The neck is the part of the body in many terrestrial or secondarily aquatic vertebrae that distinguishes the head from the torso or trunk the Latin term signify "of the neck" is the "cervical". The cervical spine supports the head allowing precious movement and position. It may be considering the pillar of the head. Cervical spine consists of seven cervical vertebrae, out of which the 1st, 2nd and 7th are a typical. The cervical spine can be divided into the sub-occipital region and "typical" cervical region.

Neck pain is major problem around the world and all age range population affected from neck pain dysfunction. To most common reasons have been identified to visit health care providers including physiotherapist are the neck pain and low back pain with huge amount financial burden per annum (Hogg-Johnson 2008).[2]

Neck pain also appeared as a leading cause of disability and neck pain dysfunctions are getting higher in clinical practice and have come in ranked number 4 out of 291health conditions list (Buchbinder, 2013).[48]

Many non-invasive treatment techniques are available for the management of neck pain, includes cervical collars, manipulation, mobilization, exercise therapy, soft tissues work, acupuncture regime, pain medications, NSAIDS steroids and electrotherapy including short wave diathermy, ice application and transcutaneous electrical nerve stimulation (Pak. J Pharma, sci, vol.27,2014).[50]

Abnormal biomechanics of body movement due to inadequate muscle strength, endurance and joint mobility can result to abnormal physical load to various tissues leading more prone to musculoskeletal injuries. There are many causative factors of neck pain. Individuals risk factors are sex (females are more prone than males), age, frequency and type of exercise, comorbid conditions. (IJMR Health Sciences, 2017).[36]

Manual therapy technique are skilled hand movements and skilled passive movements of joints and soft tissue and are intended to improve tissue extensibility, increase range of motion, induce relaxation, mobilize or manipulate soft tissue and joints, modulate pain and reduce soft tissue swelling, inflammation or restriction. (APTA 2019)

Mobilization of spinal segments are frequently applied in clinical practices in the management of non-specific neck pain (Cranes et al, 2010).

Although some evidences suggest that spinal manipulations technique consists of high-velocity thrust with low amplitude hands on application at spinal segment has positive outcome in short-term (Pak. J. pharm, 20140).[2,49]

The “manual therapy” protocol will consist of three techniques based on scientific evidence for the treatment of neck pain. These techniques represent a very close approximation to the treatment that is performed in the daily clinic, outside the research protocols. This protocol will be applied in three treatment sessions, cervical articular mobilization (2Hz, 2min×3series) (Brazilian clinical trials,2018). [4,45,46,47,]

Manual therapy may be defined as “the use of hands to apply a force with a therapeutic intent (smith 2007) widely used MTs are joint mobilization.[16]

The common treatment of neck disorders focusses on decreasing pain and disability. In a few studies exercise therapy programs have been appeared to have a positive effect on decreasing pain and discomfort

in patients with neck pain.

PNF stretching is an advanced form of flexibility training. It involves the contraction and stretching of muscles. It is based on neuromuscular rehabilitation programmed. It was designed to relax muscles and increased tone or activity. During PNF stretching, three muscle actions are used to facilitates the passive stretch. Both isometrics and concentric muscles actions of the antagonist (the muscle being stretched) are used before a passive stretch to achieve autogenic inhibition. The isometric muscle action is known as a hold and concentric action is a contract. A concentric muscle action of the agonist called agonist contraction, is used during a passive stretched of the antagonist to achieve reciprocal inhibition. Each of these techniques also involves passive, statics stretches that are referred to as relax.

There are three types of techniques for PNF stretching: - Hold-Relax, Contract-Relax, Hold-Relax with agonist contraction (Human kinetic journal 2018).

Neuro-muscular facilitation exercise (NFE) is based on some movement patterns to facilitate and correct sensory motor function. It has been suggested impulses emerging from proprioceptive receptors in the muscles therefore pain may decrease, and the strength of muscles may be improved. The proprioceptive function of cervical muscles plays an important role in producing a sufficient neck muscle contraction to keep head and neck is an upright position.[43]

Objectives

1. To evaluate the effectiveness of Manual Therapy and PNF Stretching Exercises in reducing pain and improving functional disability in students suffering from mechanical neck pain.

2. To compare the effect of Manual therapy and PNF Stretching Exercises in students having mechanical neck pain.

II. MATERIAL AND METHODOLOGY:

The design of the study was Experimental study. Ethical approval for the study was obtained from Institutional Review Board. Individuals with cervical pain were offered the chance to participate in this study via posters and letters given to local doctor's clinics and via e-mailed information to staff and students at the local universities. Study was carried out at outpatient physiotherapy clinic by clinical professional therapist who is qualified physiotherapist registered with appropriate professional bodies who ensure the quality of clinical professional.

Participants:

A total of 30 subjects were included in the study. The subjects were randomly assigned according to the inclusion and exclusion criteria into two groups with 15 subjects in each group.

Inclusion Criteria:

- Neck pain of less than 12-week duration.
- Age limit: - 18-23 years.
- Current neck pain.
- Mechanical Neck Pain.

Exclusion Criteria:

- Irradiated neck pain.
- Osteoporosis.
- Vertebral fracture.
- Tumors.
- Metabolic diseases.
- Previous Neck surgery

Intervention

The treatment to the two groups was given for 15 days.

Group A: - Included 15 patients who were treated hot packs, PNF stretching and neck isometrics.

Isometric Exercise for Neck muscle Received (Group A).

Patient position: - sitting on chair.

Therapist position: - standing beside the patient.

Isometric flexion

- Dominant hand on the forehead.
- Firmly pushes the head against the hand.
- For 10 second and repeat 5 times.

Isometric extension

- Hand behind their head.
- Firmly pushes the head against the hand.
- For 10 second and repeat 5 times.

Isometric side-flexion

- Hand on right or left side of head.
- Firmly pushes the head against the hand.
- For 10 second and repeat 5 times.

Isometric neck rotation

- Hand on the right or left cheek.
- Firmly turn the face against the hand.
- Hold for 5 second and repeat 5 times.

PNF stretching for Neck pain: - (5 days a week for 2 weeks)

- Patient position: supine.
- Therapist position: standing.
- Muscle taken passively by therapist in extreme stretched position.
- Patient is allowed to contract the stretched muscle isometrically for 6-10 seconds.
- Now, patients are instructed to relax the muscle gradually, as the patient relax the muscle, therapist stretches the muscle passively into extreme range in the smooth and controlled manner.
- Follows: Isometric contraction- Passive stretching= Hold Relax stretching.

Moist heat (Hot-pack) received (Group A): -

- Patient position-supine position for 20-minutes.
- Therapist position- standing beside patient.

Group B: - Included 15 patients who were treated hot packs, Manual Therapy and neck isometrics.

Manual Therapy (Cervical Mobilization): -

- Manual Therapy protocol will consist mobilization technique based on scientific evidence for the treatment of neck pain. This technique represents a very close approximation to the treatment that is performed in the daily clinic.
- Cervical mobilization (2min x 3series).

Isometric Exercise for Neck muscle Received (Group B).

Patient position: - sitting on chair.

Therapist position: - standing beside the patient.

Isometric flexion

- Dominant hand on the forehead.
- Firmly pushes the head against the hand.
- For 10 second and repeat 5 times.

Isometric extension

- Hand behind their head.
- Firmly pushes the head against the hand.
- For 10 second and repeat 5 times.

Isometric side-flexion

- Hand on right or left side of head.
- Firmly pushes the head against the hand.
- For 10 second and repeat 5 times.

Isometric neck rotation

- Hand on the right or left cheek.
- Firmly turn the face against the hand.
- Hold for 5 second and repeat 5 times.

Moist heat (Hot-pack) received (Group B): -

- Patient position-supine position for 20-minutes.
- Therapist position- standing beside patient.

Outcome Measures:

- **Neck Disability Index: -** It is a widely used questionnaire designed to measure a patient's neck pain and how it affects their daily life. It is commonly used by healthcare professionals to assess the impact of neck pain on activities such as work, personal care, and recreation. Consists of 10 sections, each addressing different aspects of daily life affected by neck pain: Pain Intensity, Personal Care (Washing, Dressing, etc.), Lifting, Reading, Headaches, Concentration, Work, Driving, Sleeping, Recreation. Each section is scored on a 0-5 scale, where: 0 = No disability, 5 = Maximum disability. The total score is calculated by summing the points from all 10 sections, with a maximum score of 50.

- **Numeric Pain Rating Scale: -** The Numeric Pain Rating Scale (NPRS) is a simple and widely used tool to assess pain intensity. It allows patients to rate their pain on a 0 to 10 scale, with 0 meaning "no pain" and 10 representing "the worst pain imaginable."

- **PNF Stretching: -** It is an advanced flexibility training technique that involves a combination of stretching and contracting the muscle. It is widely used in physical therapy, sports training, and rehabilitation to improve flexibility and range of motion.

III. Manual Therapy (Cervical Mobilization): - Cervical mobilization is a manual therapy technique used to restore normal movement, reduce pain, and improve function in the neck (cervical spine). It involves controlled, passive movements performed by a therapist to improve joint mobility, reduce muscle tension, and enhance circulation.

IV. DATA ANALYSIS AND RESULT:

Statistical package for the Social Sciences (SPSS) version 21 was used. Level of significance was set as $p<0.05$. Baseline demographic and clinical characteristics for each group has been explained. Baseline matching showed no significant difference between the groups. ($p>0.05$).

Between the Groups: -

Group A: - To assess the effectiveness of NDI and NPRS during PNF stretching exercises in reducing mechanical neck pain and improving functional disability among undergraduate students. N = 15.

- The below table shows that the calculated 't' value in the pre-test and post-test NDI & NPRS group is statistically significant at P<0.05% level. Hence, H0 is rejected. It can be concluded that PNF stretching exercises was effective which was based on NDI & NFRS scores in reducing mechanical neck pain and improving functional disability. In other words, differences in pre-test and post-test NDI & NFRS mean scores of undergraduate students is significant.

Table-1: Group A: - NDI and NPRS during PNF stretching exercises

Group-A Basis	NDI		NPRS		Mean Difference	't'- value
	Mean	SD	Mean	SD		
Pre-Test	34.6	8.58	7.60	0.98	27	**>3.86**
Post-Test (1st Week)	16.6	2.66	4.46	1.51	12.14	**>7.25**
Post-Test (2st Week)	7.46	1.35	2	0.92	5.46	**>4.89**

(*-P<0.05, significant and **-P<0.01 & ***-P<0.0001, Highly significant)

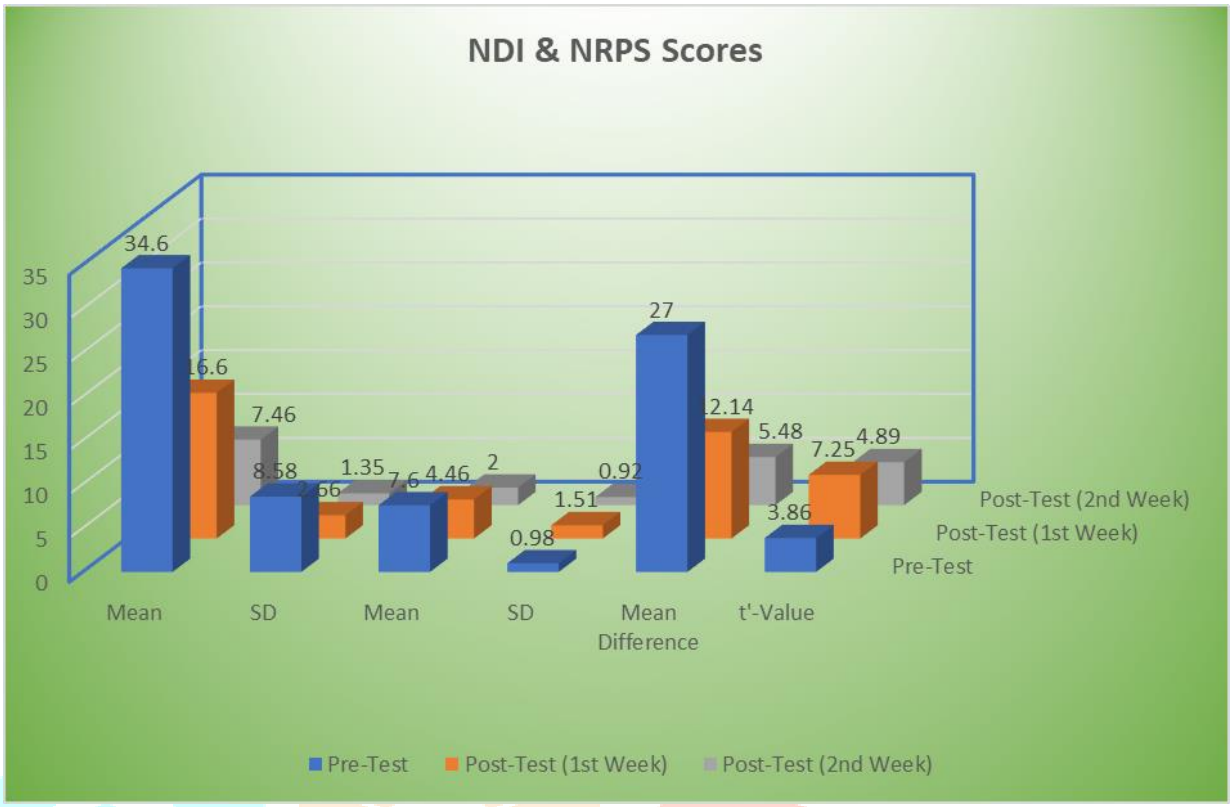

Figure 1:- Depicting the effectiveness of NDI & NPRS during PNF stretching exercises. (Group-A)

Group B: - To assess the effectiveness of NDI & NFRS during manual therapy in reducing mechanical neck pain and improving functional disability among undergraduate students. N = 15.

- The below table shows that the calculated 't' value in the pre-test and post-test NDI & NPRS group on weekly basis was statistically significant at P<0.05% level. Hence, H_0 is rejected. It can be concluded that manual therapy was effective based on NDI & NFRS scores in reducing mechanical neck pain and improving functional disability. In other words, differences in pre-test and post-test NDI & NFRS mean scores of undergraduate students is significant.

Table-2: Group B: - NDI and NPRS during PNF stretching exercises in reducing mechanical neck pain.

Group-B / Basis	NDI		NPRS		Mean Difference	't'- value
	Mean	SD	Mean	SD		
Pre-Test	34.93	10.03	7.93	0.79	27	**>2.65**
Post-Test (1st Week)	28.28	8.37	5.86	0.83	22.42	**>7.37**
Post-Test (2st Week)	22	7.07	3.67	1.36	18.33	**>6.54**

(*-P<0.05, significant and **-P<0.01 & ***-P<0.0001, Highly significant)

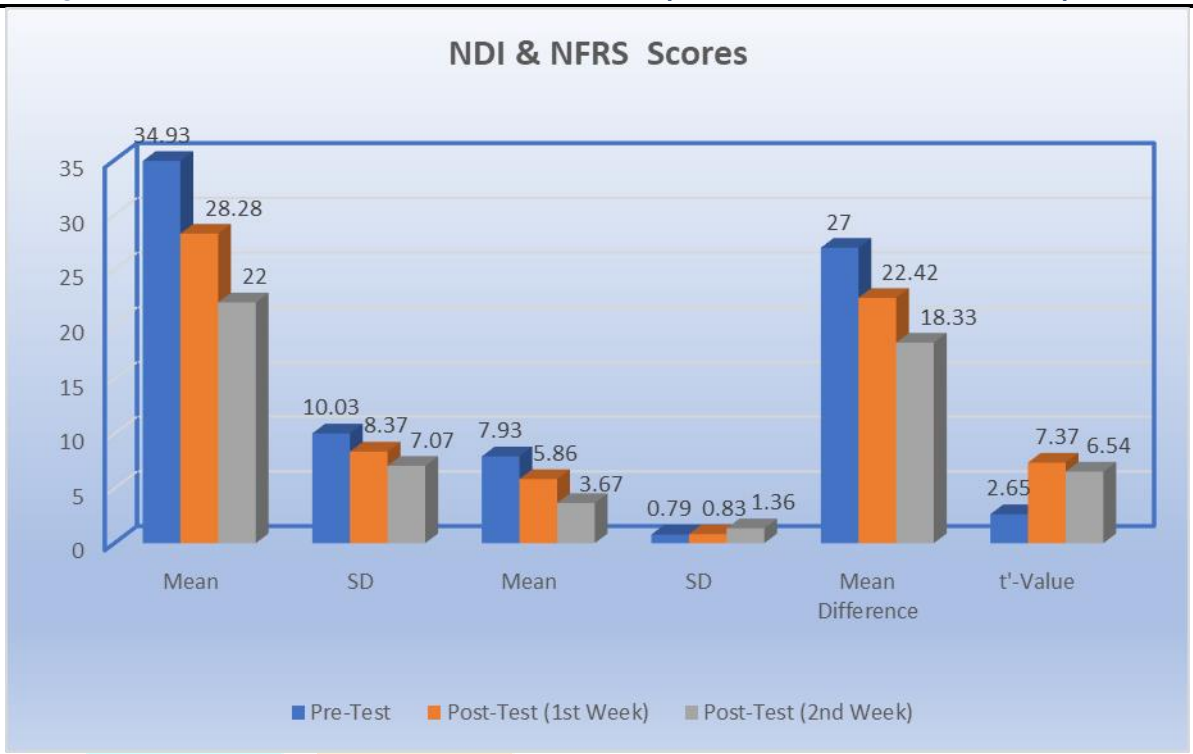

Figure 2: - Depicting the effectiveness of NDI & NPRS during manual therapy (Group-B)

Comparison with in the groups: -

- To compare the effectiveness of Manual Therapy and PNF Stretching Exercises in reducing mechanical neck pain and improving functional disability among undergraduate students.

Table 3: - To compare the effectiveness of PNF stretching exercises and Manual Therapy in reducing mechanical neck pain

Basis	Pre-Test		Post-Test		Mean Difference	't'- value
	Mean	SD	Mean	SD		
Group A (PNF)	21.1	14.98	7.63	5.82	13.47	**4.39**
Group B (Manual Therapy)	21.43	15.4	14.95	11.83	6.48	**3.84**

(*-P<0.05, significant and **-P<0.01 & ***-P<0.0001, Highly significant)

- The above table shows that the calculated 't' value in the pre-test and post-test scores in group A and B was 4.39 and 3.84. However, it shows that Group A and B are statistically significant at P<0.05% level. As a result, H0 is rejected. It can be concluded that PNF stretching exercises and manual therapy are effective in reducing mechanical neck pain and improving functional disability of the undergraduate students.

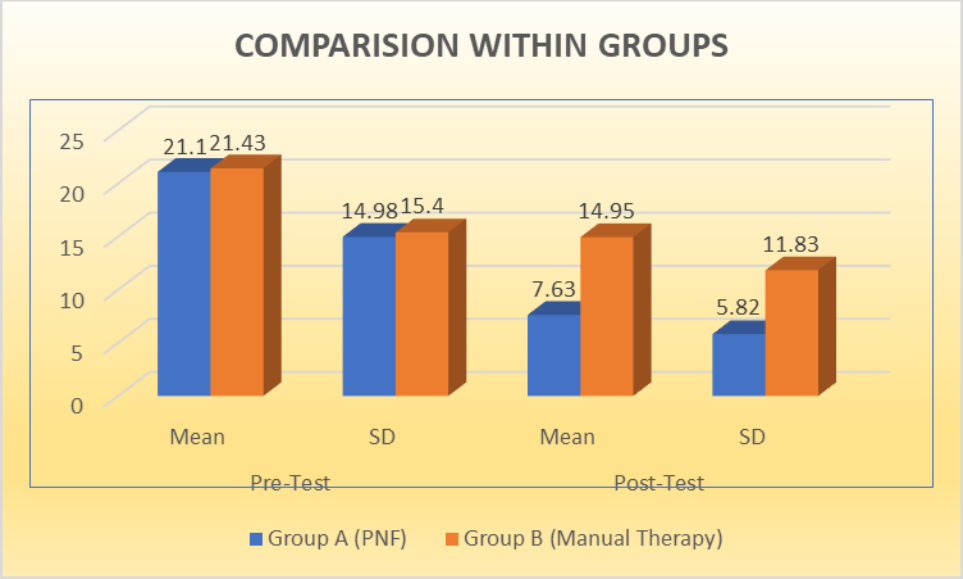

Figure 2: - Depicting comparison within groups

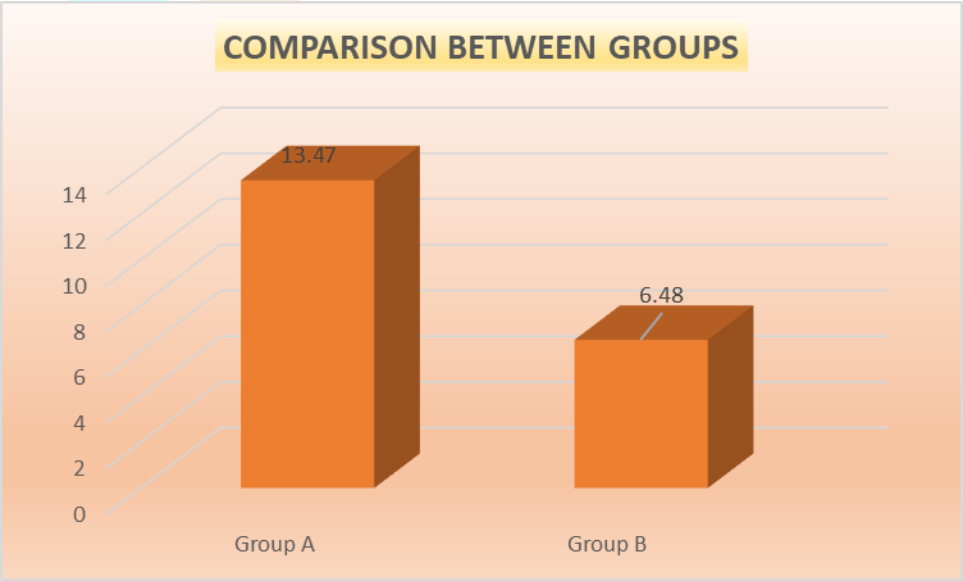

Figure 4: - Depicting comparison between groups

- The above figure shows the mean scores between Group-A and Group-B. When comparing between the groups the mean scores for PNF stretching exercises in group A was 13.47 and manual therapy in group B was 6.48. Based on the mean scores and their differences, it has been concluded that both PNF stretching exercises (Group-A) and Manual therapy (Group-B) are statistically significant in reducing mechanical neck pain and improving functional disability among undergraduate students (greater than P<0.05% level).

- In addition, the difference between the mean scores of PNF Stretching exercises (Group A) and manual therapy (Group B) are moderate whereby it has been concluded that PNF Stretching exercises is better than manual therapy in reducing and improving neck pain and functional disability of the students.

V. DISCUSSION:

This is a experimental study to evaluate the effects of Manual Therapy and PNF Stretching in under-graduate students having mechanical neck pain with functional disability. The findings from present study indicate that a program of PNF Stretching can help to decreases pain as assessed by Numeric pain rating scale and improve functional disability as assessed by Neck disability index in individual with neck pain of less than 3 months with No symptoms to a greater extent than those individuals who received Manual Therapy. Furthermore, PNF Stretching can improve overall general health and increase strength and postural stability in participants with neck pain. These improvements are observed despite the study being performed on individuals, indicating that specificity of PNF stretching is important. It appears from the results of the present study, that there was significant reduction in the NPRS and NDI scores in both experimental groups after 2 weeks. Another important observation was that there was more reduction in NPRS and NDI scores in Group A after 1st and 2nd week as compared to Group B.

Both experimental Groups received Hot Packs for 20 minutes prior to treatment (Manual therapy and PNF Stretching exercises). French et al demonstrated that the application of Hot packs prior to treatment increase pain threshold. The proposed mechanism of this effect includes direct and immediate reduction of pain by activation of spinal gating mechanism and indirect, later and nerve firing rate has also been found to changes in temperature. Elevation of muscle temperature to 42ºcelsius has been shown to result in a decreased firing rate of type II muscle spindle efferent and gamma efferent and an increased firing rate of type I b fibers from Golgi tendon organs. These changes in nerve firing rates are thought to contribute to a reduction in firing rate of alpha motor neurons thus reduction in muscle spasm.

Both experimental Groups received Neck isometrics exercises prior to the treatment (Manual therapy and PNF Stretching exercises). Trupti Siddapur et al demonstrated that the isometric exercise is an static form of exercise in which a muscle contract and produces a force without generating an appreciable changes in the length of the muscle and without visible joint motion. Repetitive isometric contractions against near-maximal resistance have been shown to be effective method to improve isometric strength of a muscle. Functional demands usually involve the need to hold a position against a certain amount of resistance over a period of time. Hence, muscular endurance has been suggested to play an important role in maintaining sufficient postural stability than muscle strength. It also helps in preventing injuries during daily living tasks. [10,24,40]

Group A (PNF Stretching) showed significant reduction in the NPRS and NDI Scores. Also, on comparing the two groups Group A showed more significant results. Ethan Konoza suggested that muscle spindle and Golgi tendon organs are two types of muscle proprioceptors that are protective in nature but also play an important role in how these proposed mechanisms work to increase ROM during PNF Stretching. Muscle spindle are located within the belly of a muscle and senses stretch or lengthening of a muscle. When a muscle become stretched to a point the muscle spindle too is stretched. The stretching of the muscle spindle causes an impulse and an afferent neuron is sent to the CNS through the spinal cord. The CNS receives and interprets this information.

If a muscle is lengthened too far the CNS will send an efferent neuron to cause a reflex contraction called a myotatic reflex to contract to prevent any more lengthening to that muscle to prevent damage or tearing. (power and howely,2018, muscolino 2017).[15]

Faith kaya,(2018), positive effects of PNF stretching on sports performance- suggest that stretching practices are irreplaceable component of training process in terms of preserving natural flexibility of joint, increase their efficiency and removing injury risk. In addition to this, the real effect of increases flexibility on athletic performance keeps its uncertainty.[55] Group B (Manual Therapy) showed significant improvement ($P<0.005$) in terms of reduction in NPRS and NDI Scores. Gross et al. (2004) has suggested that mobilization and manipulation technique (single session to many sessions 3 weeks to 11 weeks) with exercises regime appeared beneficial in comparison with mobilization and manipulation technique applied alone for persistent type mechanical neck disorders.[18] A systemic review concluded spinal manipulative

therapy and mobilization technique as a viable choice for the management of both neck pain and low back pain but lack of long term follows up (Bronfort, 2004), whereas we did immediate level of follow up. Spinal manipulation technique was statistically important by reducing chronic neck pain; neck disability.[8,9]

Giles et al.(1999) study showed 25% and 33% reduction on the visual analogue scale and NDI in manual therapy group as compared with acupuncture and medicine use. Another study supported our findings that spinal manipulation technique with strengthen exercises seems to be more useful in treating patients with chronic neck pain as compared with spinal manipulation technique alone(Bronfort,2001).[17]The main aim of the study was to investigate if individuals improved due to the intervention and as the individuals improve at different rates, a within group analysis was performed to determine the significant difference after the intervention period compared to baseline values. Nevertheless, despite the large variation in data for each individual, the data for each group at the start of the study were found to be similar.

CONCLUSION:

- The current study showed that there was significant difference with Manual therapy and PNF stretching exercises in reducing neck pain and improving functional disability. Additionally, PNF Stretching was found to be more beneficial as compared to Manual therapy in reducing pain and improving functional disability in patients with mechanical neck pain.

VI. AUTHORS CONTRIBUTION

- All authors conceptualized the study and participated in the study screening, selection and manuscript preparation. All authors provided intellectual content and approved the manuscript for publication.

VII. CONFLICT OF INTEREST STATEMENT

- No conflicts declared

VIII. FUNDING

- The authors have nothing to disclose

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