ISSN- O: 2458 - 868X, ISSN–P: 2458 – 8687
Index Copernicus Value: 49. 23

*International Journal of Medical Science and Innovative Research (IJMSIR)*
*IJMSIR : A Medical Publication Hub*
*Available Online at: www.ijmsir.com*
*Volume – 3, Issue –3, June - 2018, Page No. : 185 – 191*

# To Assess the Combined Effect of Neck and Shoulder Girdle Strength Training on Pain and Functional Disability in Patients with Chronic Neck Pain

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**Type of Publication:** Original Research Paper

**Conflicts of Interest:** Nil

**Abstract**

**Objective:** To assess the combined effect of neck and shoulder girdle muscles strengthening in chronic neck pain patients.

**Methods:** 50 patients were taken randomly and divided into two groups. Group A and Group B. Each group contained 25 patients. Each patient was assessed for neck pain and impairment according to Visual Analogue Scale and Neck Disability Index before interventions and post intervention was also checked. Group A- The subjects received strengthening exercises for neck muscles along with shoulder girdle muscles with the help of Thera band for 12 sessions i.e. 6 days a week. Each exercise was done for 10 times with a hold of 10 seconds. Exercises were started initially with yellow color theraband and were progressed to red color theraband in the second week. Group B (Control group) subjects received strengthening exercises for neck muscles with the help of theraband for 12 sessions i.e. 6 days a week. Each exercise was done for 10 times with a hold of 10 seconds. After the intervention was completed the neck pain and impairment was assessed according to Visual Analogue Scale and Neck Disability Index. And readings were recorded for both the groups.

**Results:** Pre and Post treatment results within the groups showed control group i.e. Group B to be more significant for cervical range of motion but between the two groups, Group A was more significant in comparison to Group B. On the contrary while analyzing the functional impairment component both Pre and Post treatment results within the groups and between the groups showed that Group B is more significantly better then Group A

**Conclusion:** Present study concluded that there is significant improvement in the cervical range of motion in the combined strength training group than the control group. The pain and disability also improved in both the groups but there is more improvement in the control group than the combined strength training group.

**Keywords**: VAS, ROM, NDI, Chronic Neck Pain, Theraband

## Introduction

Neck disorders remain a common problem in modern industrialized countries.[1]It is a frequent source of impairment causing human suffering and affecting the well-being of individuals.[2] The origin of neck pain is thought to be multifactorial.[3] The prevalence of neck pain has been reported to be 22-30%.[4] Women are more likely than men to develop and suffer from persistent neck pain.[5] Mechanical, non-specific neck pain has impact on the functional status of

the patient, which effects basic activities of daily living and at work place also[6] Sometimes pain may lead to disability.[7, 8]

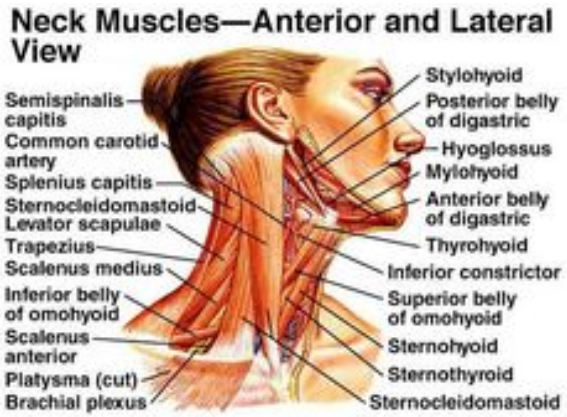


Figure 1 : Neck Muscles (Source www.google.com)

Poor posture is also a common cause of neck pain and related symptoms.[9-10] Neck strength training has shown to be effective in reducing neck pain and disability associated with it.[1] Some studies show that neck shoulder muscle performance improved more after strength than it did after passive physiotherapy.

**Need For Study**

There have been many studies which suggest the effect of neck muscles strengthening in reducing neck pain in chronic neck pain patients. But very few studies show the effect of strengthening the shoulder girdle muscles with neck muscles on neck pain in chronic neck pain patients. Therefore the need for the study focuses on to see the combined effect of neck and shoulder girdle muscles strengthening in chronic neck pain patients.

**Methods**

- **Study Design:** Experimental Study..
- **Sampling Method:** Random Sampling Method
- **Study Set-Up:** Subjects were recruited from the Outpatient Department of Orthopaedic and Outpatient Department of Physiotherapy, Jimma University Specialised Hospital, Jimma, Ethiopia.
- **Sample Size:** 50 Subjects.

**Inclusion Criteria**

- Patients having constant or frequently occurring neck pain for more than 3 months.
- Both males and females
- Age group 20-35 years.
- Neck muscle strength more than grade 3+/ 4.
- Shoulder girdle muscle strength more than grade 3+/ 4.

**Exclusion criteria**

- Cervical spondylosis.
- Cervical Disk prolapse
- Cervical Spinal stenosis
- Postoperative conditions in the neck and shoulder areas
- History of severe trauma, instability of spine
- Torticollis
- Peripheral nerve entrapment

Any shoulder pathology

- Inflammatory rheumatic diseases
- Severe psychiatric illness or non-cooperative patients
- Tumors

**Materials Used**

1) TheraBand
2) Universal Goniometer.

**Procedure**

Patients who fulfilled the inclusion criteria were taken up for the study purpose. Written consent regarding their participation was taken. The purpose of the study and procedure was explained to the subjects.

50 patients were taken randomly and divided into two groups. Group A and Group B. Each group contained 25 patients. Each patient was assessed for neck pain and impairment according to Visual Analogue Scale and Neck Disability Index before interventions and post intervention was also checked.

Group A- The subjects received strengthening exercises for neck muscles along with shoulder girdle muscles with

the help of Thera band for 12 sessions i.e. 6 days a week. Each exercise was done for 10 times with a hold of 10 seconds. Exercises were started initially with yellow color theraband and were progressed to red color theraband in the second week.

Group B (Control Group). The subjects received strengthening exercises for neck muscles with the help of Thera band for 12 sessions i.e. 6 days a week. Each exercise was done for 10 times with a hold of 10 seconds.

After the intervention was completed the neck pain and impairment was assessed according to Visual Analogue Scale and Neck Disability Index. And readings were recorded for both the groups.

**Group a exercises included:**

1) **Shoulder Shrug**- subject was asked to stand on the theraband with feet apart and look straight ahead. Straighten up, keeping the knees straight, with the arms straight down at the sides (palms in). Slowly raise the shoulders in a shrug, then down to the original position. This movement is completed while keeping constant tension on the band.
2) **Standing Row**- The theraband was attached in a doorjamb or other. Subject was asked to stand facing the door. Exercise was started with the arms slightly flexed and with the band taut. Subject was asked to pull the band toward the chest. While pulling the band, the elbows should be drawn along the side of the body until the hands touch the lower ribs. Then return slowly to the start position.
3) **Dynamic Hug**- With the tubing attach behind the subject's shoulder height, subject was asked to grip both ends of the tubing in hands with the tubing on the outside of the shoulders. Then subject pulls the band forward and slightly downward in a 'hugging' motion. Hold for 10 seconds and return slowly to the starting position.
4) **Internal Rotation**- Theraband was attached at waist level in a doorjamb. While standing sideways to the door and looking straight ahead, subject was asked to grasp one end of the handle and pull the band until it is taut. Feet were shoulder width apart and the knees were slightly flexed. The elbow was placed next to the side and was flexed at 90 degrees. Taking the band in the hand, move the hand toward the chest as far as possible. Hold for 10 seconds and 10 repetitions were given and then return to the start position.
5) **External Rotation**- Theraband was attached at waist level in a doorjamb. While standing sideways to the door and looking straight ahead, subject was asked to grasp one end of the band and pull the band until it is taut. Feet were shoulder width apart and the knees were slightly flexed. The elbow was placed next to the side with the hand as close to chest as possible. Taking the band in the hand, move the hand away from the body as far as. Hold of 10 seconds was given with 10 repetitions and then return to the start position.

**Group B exercises included**

1. **Neck flexion** was performed with subjects seating on the chair and the theraband was fixed on the subject's forehead. Then the subject was asked to flex the neck and hold it for 10 seconds. 10 repetitions were given
2. **Neck extension** was performed with subject seating on the chair and the theraband fixed on the back of the head and subject was asked to extend the neck. Hold period of 10 seconds was given with 10 repetitions.
3. **Neck side flexion** was performed with subject seating and theraband fixed on the side of the head. Subject was asked to side flex his neck on the opposite side of the band. Hold of 10 seconds was given for 10 repetitions.

**Outcome Measures**

1) Visual Analogue Scale (VAS)
2) Neck Disability Index (NDI)
3) Cervical range of motion.

**Data Analysis**

Data analysis was done using STATA for the range of motion; pain and neck disability index. Data was recorded and tabulated. Statistical analysis was done using two ways ANOVA. Comparisons of Means and Standard Deviations were analyzed to see the significance difference between and within the two groups.

**Result**

Table: 1 Comparison of Means and Standard Deviation for ROM, VAS and NDI within Group- A

| Pre Post | Flexion | Extension | Lat. Flexion | Rotation | VAS | NDI |
|---|---|---|---|---|---|---|
| **Mean** | 37.80 | 38.60 | 25.50 | 40.60 | 6.70 | 21.29 |
| **SD** | 6.788 | 12.578 | 4.195 | 10.234 | .614 | 11.336 |

Table: 2 Comparisons of Means and Standard Deviation for ROM, VAS and NDI within Group- B

| Pre Post | Flexion | Extension | Lat. Flexion | Rotation | VAS | NDI |
|---|---|---|---|---|---|---|
| **Mean** | 63.70 | 60.80 | 40.80 | 56.60 | 3.04 | 10.50 |
| **SD** | 4.929 | 13.107 | 4.882 | 5.753 | 1.124 | 5.791 |

Table: 3 Comparisons of Means and Standard Deviation for ROM, VAS and NDI for Group- A

| Group A | Flexion | Extension | Lat. Flexion | Rotation | VAS | NDI |
|---|---|---|---|---|---|---|
| **Mean** | 50.30 | 55.20 | 34.50 | 50.40 | 4.66 | 14.64 |
| **SD** | 16.080 | 14.948 | 9.649 | 12.529 | 2.45 | 10.961 |

Table: 4 Comparisons of Means and Standard Deviation for ROM, VAS and NDI for Group- B

| Group B | Flexion | Extension | Lat. Flexion | Rotation | VAS | NDI |
|---|---|---|---|---|---|---|
| **Mean** | 51.20 | 44.20 | 31.80 | 46.80 | 5.08 | 17.16 |
| **SD** | 12.395 | 17.213 | 8.003 | 10.240 | 1.536 | 9.903 |

Table: 5 Two Way ANOVA for Flexion ROM

| Flexion ROM | Partial SS | df | MS | F | Prob > F |
|---|---|---|---|---|---|
| **Pre- Post Treatment within Groups** | 16770.25 | 1 | 16770.25 | 542.80 | 0.0000 |
| **Between Groups** | 20.25 | 1 | 20.25 | 0.66 | 0.4202 |

Table: 6 Two Way ANOVA for Extension ROM

| Extension ROM | Partial SS | df | MS | F | Prob > F |
|---|---|---|---|---|---|
| **Pre- Post Treatment within Groups** | 12321 | 1 | 12321 | 91.55 | 0.0000 |
| **Between Groups** | 3025 | 1 | 3025 | 22.48 | 0.0000 |

Table: 7 Two Way ANOVA for Lateral Flexion ROM

| Lateral Flexion | Partial SS | df | MS | F | Prob > F |
|---|---|---|---|---|---|
| **Pre- Post Treatment within Groups** | 5852.25 | 1 | 5852.25 | 342.99 | 0.0000 |
| **Between Groups** | 182.25 | 1 | 182.25 | 10.68 | 0.0015 |

Table: 8 Two Way ANOVA for Rotation ROM

| Rotation | Partial SS | df | MS | F | Prob > F |
|---|---|---|---|---|---|
| **Pre- Post Treatment within Groups** | 6400 | 1 | 6400 | 97.74 | 0.0000 |
| **Between Groups** | 324 | 1 | 324 | 4.95 | 0.0285 |

Table: 9 Two way ANOVA for VAS Scale

| Vas | Partial Ss | Df | Ms | F | Prob > F |
|---|---|---|---|---|---|
| **Pre- Post Treatment Within Groups** | 334.89 | 1 | 334.89 | 702.57 | 0.0000 |
| **Between Groups** | 4.41 | 1 | 4.41 | 9.25 | 0.0030 |

Table: 10 Two Ways ANOVA for NDI Scale

| NDI | Partial SS | df | MS | F | Prob > F |
|---|---|---|---|---|---|
| **Pre- Post Treatment within Groups** | 2911.6816 | 1 | 2911.6816 | 36.06 | 0.0000 |
| **Between Groups** | 158.76 | 1 | 158.76 | 1.97 | 0.01641 |

On comparing Flexion ROM pre and post treatment results within the groups showed significant results, Group B showed more significant results in comparison to Group A but when comparing between the groups there was no significant difference between the two groups. **(Table 5 and Table 1-4)**. On comparing Extension ROM pre and post treatment results within the groups showed significant results, Group B was more significant than Group A, but on comparison between the groups Group A showed more significant results in comparison to Group B. **(Table 6 and Table 1-4)**. On comparing Lateral Flexion ROM pre and post treatment results within the groups showed significant results, Group B was more significant than Group A but on comparison between the groups Group A showed more significant results in comparison to Group B. **(Table 7 and Table 1-4)**. On comparing Rotation ROM pre and post treatment results within the groups showed significant results, Group B was more significant than Group A but on comparison between the groups Group A showed more significant results in comparison to Group B. **(Table 8 and Table 1-4)**. On comparing VAS pre and post treatment results within the groups showed significant results, Group A was more significant than Group B but on comparison between the groups Group B showed more significant results in comparison to Group A. **(Table 9 and Table 1-4)**. On comparing NDI pre and post treatment results within the groups showed significant results, Group A was more significant than Group B but on comparison between the groups Group B showed more significant results in comparison to Group A. **(Table 10 and Table 1-4)**.

**Discussion**

The present study showed that the combined strength training for neck and shoulder girdle muscles significantly improved the range of motion in chronic neck pain patients as compared to the group of only neck muscles strengthening. The pain and disability component improved in both groups but more functional improvement was seen in Group B that is the only neck muscles strengthening group.

Significant difference was seen in the pain intensity, cervical range of motion and disability within the groups on the 12$^{th}$ day of the treatment, but the improvement was more seen in the combined training group (Group A) than the control group (Group B). The improvement in pain component was may be due to the increase in endorphins that occurred after training, and better neuromuscular control, may decrease activity-related pain. Strong muscle

contractions activate muscles' ergo-receptors (stretch receptors).The afferents from the receptors cause endogenous opioids to be released and also cause the release of b-endorphin from the pituitary. Thes secretions may cause both peripheral and central pain to be blocked. Another reason for pain is the imbalance between muscle fiber size and capillary supply. With this consideration, exercises that stimulate continuous circulation and capillary growth with appropriate energy-saving motor control are beneficial.[11]

So it has been seen that the strength training exercises stimulate the circulation in the muscle during exercises and because of the increased circulation there is reduction in the associated muscle pain. There are several possible mechanisms by which it is possible to decrease pain and to increase load tolerance through active training. Patients with chronic neck pain may suffer from sensorimotor impairment. When proprioception is impaired, the timing of eccentric contraction of the neck muscles is delayed and because neck stability in performing activities is insufficient, this is thought to lead to excessive strain and micro trauma.[12]

Some studies have shown that pain is major factor that reduces the cervical range of motion in neck pain patients. Also the decreased strength results in limited cervical range of motion. The present study also showed reduced cervical range of motion in the neck pain patients before the strength training program was incorporated. The results of the present study after giving strength training showed that there was significant improvement in the cervical range of motion in the combined strength training group Group A than the control group Group B. As we have seen that when the pain reduces and the strength increases there is an increase in range of motion and there is increased ability of the patient to perform the functional activities more easily and in a pain free manner. Many studies have shown various reasons behind improvement in strength of a muscle and the importance of strength training. According to the American College of Sports Medicine guidelines, the most pronounced adaptations at the muscle cellular level are achieved in response to progressive and periodized dynamic strength training involving both concentric and eccentric contractions with a high intensity (8–12 RM for beginners) and a high volume (multiple sets).[5]

David G in his study reported that moderate loads (e.g. 50%–60% of one repetition maximum (1RM)) and higher repetitions (e.g. 15–20 repetitions) may be most beneficial for enhancing muscular strength and endurance during the initial adaptation period. They also demonstrated that high-repetition – low-load and low-repetition – high-load resistance training programs resulted in a similar enhancement of maximal strength.[13]

**Conclusion**

This study concluded that there is significant improvement in the cervical range of motion in the combined strength training group than the control group. The pain and disability also improved in both the groups but there is more improvement in the control group than the combined strength training group.

**Ethical Approval**

Ethical approval was taken from the Committee for Advanced Scientific Research Ethical Approving Body, Jimma University, Jimma, Ethiopia.

**Funding**

No funding was taken for the study from any agency/organization.

**Conflict Of Interest**

There is no conflict of interest of any sort.

**Acknowledgements**

We are thankful to the department of physiotherapy, Department of Technology, Jimma University, Ethiopia, for helping in carrying out this research to a fruitful outcome.

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