Effectiveness of Feldenkrais Method vs Cranio-Cervical Flexion Exercises for Neck Pain and Forward Head Posture in Undergraduate Students with Chronic Neck Pain - A Comparative Study

[1]Nidhisha Chetan Walinjkar, [2]Dr. Abhijit Satralkar

[1]BPT Intern, [2]Principal & Professor AIMS College of Physiotherapy

[1]Modern College of Physiotherapy, Pune, Maharashtra, India.

Abstract:

Background: Effectiveness of Feldenkrais Method vs Cranio-Cervical Flexion exercises for neck pain and forward head posture in undergraduate students with chronic neck pain.

Objective: To study and compare the effectiveness of the Feldenkrais Method (Awareness Through Movement) and Cranio-Cervical Flexion Exercises on neck pain and forward head posture using the Numeric Pain Rating Scale (NPRS) and Craniovertebral Angle (CVA) in undergraduate students with chronic neck pain in 3 weeks of intervention period.

Methods: A comparative study was conducted on 60 undergraduate students with chronic neck pain and forward head posture. Participants were randomly divided into two groups: Group A received Feldenkrais Method, and Group B received Cranio-Cervical Flexion Exercises for 3 weeks. Pain and posture were assessed using the Numeric Pain Rating Scale (NPRS) and Craniovertebral Angle (CVA) via Kinovea Software. Statistical Analysis compared pre and post treatment scores within and between groups.

Results: The study included 60 participants and showed statistically significant improvements ($p < 0.05$) in both groups. Group A (Feldenkrais Method) showed a reduction in NPRS from 5 to 3.467 and an increase in CVA from 47.087 to 49.473. Group B (Cranio-Cervical Flexion Exercises) had a greater improvement, with NPRS decreasing from 5.4 to 1.267 and CVA increasing from 46.49 to 51.06.

Conclusion: This study concluded that both the techniques are effective with higher significance but Craniocervical Flexion Exercise are more effective than Feldenkraise Method in reducing Neck Pain and improving Forward Head Posture among the Undergraduate students with Chronic Neck Pain.

Index Terms - chronic neck pain, forward head posture, Feldenkrais Method, Cranio-Cervical Flexion Exercises, Craniovertebral Angle

I. INTRODUCTION

Neck pain is a pervasive musculoskeletal disorder and one of the leading causes of disability worldwide. The estimated 1-year prevalence of neck pain was 45.5% among office workers and ranged from 45.8% to 54.7% among healthcare professionals. A study was done in 2020 which unveils that up to 60% of undergraduate students have experienced neck pain. Neck pain can cause working hour decrements, decreased recreational activity participation, and sleep disturbance.[1]

Neck pain that persists for three months or longer is defined as chronic neck pain (CNP). CNP is becoming increasingly prevalent in society, with current predictions estimating that 48% - 67% of individuals will suffer neck pain at some stage of life. Patients with CNP demonstrate a reduced ability to maintain an upright posture and a subtle forward drift of the head, which may reflect impaired endurance of the muscle required to control the postural position of the spine over the long term.[3]

Pain around the neck causes mechanical limitations to the cervical joint, which can lead to physical limitations such as the loss of ROM. Cranio - Vertebral Angle (CVA) is a factor that significantly influences pain in those individuals with a Forward Head Posture (FHP). The decreased CVA causes flexing of the cervical vertebrae in a forward position which if maintained for a long

period of time, increases the load in the extension muscle (by increasing the external moment arm) and its surrounding connective tissues.[4]

Fig No. 1

1. Feldenkrais Exercise (FM)[5]

The method was developed by Dr. Moshe Feldenkrais (1904 - 1984), an Israeli born in Russia. The Feldenkrais Method is a form of sensory motor education. It helps to restore proprioception and coordinated movement, by combining an understanding of complexities of movement with the understanding of learning process. This leads to improved function and reduced tension and pain. The Feldenkrais Method is the way of learning - learning to move more freely and easily, to carry less stress in your body, to stop doing the things that cause pain.

Awareness through Movement (ATM) and Functional Integration (FI) are variants of the Feldenkrais Technique. By slowing down and noticing how your body function, you gain feedback upon which your nervous system can build enhanced self-awareness and improved functioning.

In Awareness through Movement (ATM), you attend to and learn from the feedback provided by your own movement, while in functional integration that feedback is enhanced by the practitioner's trained awareness and skilled touch.[2] The Feldenkrais Method does not treat medical conditions, it helps you learn to become more self-aware and to move in more efficient, less painful ways. This can help you reduce limitations and discomfort caused by the way you organize your movements and your ways of being in the world.[7]

Various studies have been performed using Feldenkrais Method- Awareness through Movement on pain, anxiety, balance, mobility, gait performance, hamstring length, head posture, progressive muscle relaxation, quality of life, etc. Studies reported statistically significant, positive benefits compared to control interventions on pain and anxiety reduction, improved balance, mobility and gait performance, increase in the length of hamstring muscle, improved body image, progressive muscle relaxation and improved quality of life.[2]

Benefits of Feldenkrais Exercise [6]

The Feldenkrais Method improves the way in which the brain coordinates posture and movement. By engaging the brain's ability to relearn and change, the Feldenkrais method improves the exchange of relevant information between the nervous system and muscles, and as a result movement becomes more comfortable. Although Feldenkrais exercises are not aerobic, they provide many of the benefits commonly associated with exercise, including increased production of synovial fluid that act as a lubricant inside your joints, increased flexibility, better circulation, improved respiratory function better coordination and balance, and an overall sense of well-being.

2. Cranio-cervical Flexion Exercise (CCFE)

Cranio-cervical flexion exercise (CCFE) aimed at strengthening the deep neck flexor muscle, such as the longus capitis and colli, which are important in supporting the cervical region.[7] CCFE do not specifically focus upon deep neck muscles but also superficial muscles.[8] Several studies also have suggested that CCFE improves an ability to control: a neutral cervical posture [9]; cervical flexion strength [10]; and neck pain and disability.[11] However, few well-designed randomized controlled trials have investigated CCFE effects on the forward head position of head.[12]

II. MATERIALS & METHODS

Study design: Comparative study

Sample size: 60

Sampling method: Convenient Sampling

Population: Undergraduate students with Chronic Neck Pain

Study Setting: Physiotherapy OPD in and around Pune

Study duration: 6 months

Intervention duration: 30 – 40 minutes

1. Selection Criteria

1.1 Inclusion criteria:

1. Age group between 18 to 25.[1]

2. Both females & males.

3. Students preparing for professional courses.

4. NPRS: On Activity- 4 to 7

5. Cranio-vertebral angle less than 50 degrees. [13]

6. Subjects who had been experiencing neck pain for more than 3 months. [14]

1.2 Exclusion criteria:

1. Surgeries of the cervical spine within past 1 year

2. Surgeries or fracture to the shoulder joint [15]

3. Cervical instability [15]

4. Cervical Radiculopathy

5. Thoracic outlet syndrome

6. Subjects taking analgesics and/ or muscle relaxants

7. Failing the postural screening

8. Trauma to cervical spine within past 1 year

9. No congenital or acquired musculoskeletal deformities

10. Scoliosis

11. Flat neck

12. Visual Deficit Patients

2. Materials

1. Pen & paper

2. Smartphone

3. Numeric Pain Rating Scale (Reliability-0.95)

4. Kinovea Software for measuring Craniovertebral angle.

5. Pressure Biofeedback Unit

6. Consent forms.

7. Data Collection Sheets

3. Procedure

3.1 Group A

Feldenkrais Exercise

1. Relax your shoulders and neck: Pay attention on the tension in your upper body. Lift and then lower down one of your shoulders slowly for duration of one minute. Just concentrate on this specific movement. But always keep the range of motion small.

2. Roll the neck: Do small circles using head from one side to the other. Roll the head slowly and gently towards back and then to the other side. Press your ear to your shoulder as far as you can and bring it around to front, lowering the chin towards chest. Keep on repeating this for duration of a minute. This movement in the Feldenkrais method is designed to lessen the tension.

3. Do ear to the shoulder exercise: In this, lower your ear to the shoulder and bring the head back to the normal, center position. Note which all body parts are involved in the movement. Do continue it for duration of one minute and then switch the sides.

4. Lean the ear to the shoulder as given in the step above. Then bring the head back to the center position. This time, do lift the shoulder to the ear and then return it to the center. Alternate the steps for duration of one minute and then repeat the same for opposite side. Don't strain while doing this exercise.

5. Sitting on the forward edge of a chair with a flat seat, slowly turn your upper body, as if to look to the right a little bit. Then return slowly to face forward and rest for a moment before doing the movement again. Keep your feet flat on the floor, and repeat this movement 6–10 times. Notice exactly how far to the right you can see easily, without feeling any strain.

6. Focus your eyes on an object or spot straight ahead of you. While your eyes continue to look at the spot or object, slowly turn your head and upper body a little bit to the right. Then slowly return to facing forward and pause. Repeat this movement 6–10 times. Don't stretch or strain, use force, or turn farther than is truly comfortable. Notice how keeping your eyes fixed restricts your turning. Relax your neck, jaw, shoulders, chest, abdomen, and legs abdomen, and legs.

7. Do movement #1 again: Slowly turn your upper body, as if to look to the right. Then slowly return to facing forward and rest. Repeat this movement 2–4 times. Is there any improvement in your ease of movement as you turn? Can you see a little farther to the right? Rest in the middle, and notice whether your left shoulder and the left side of your neck feel more relaxed.

8. Now do the movement again, but keep both your head and eyes facing forward. Repeat this movement very slowly 6–10 times. As you turn, notice how your left shoulder moves forward, and your right shoulder moves back. Relax your face, neck, shoulders, and stomach. Try to reduce any unnecessary muscular effort.

9. Do movement #1 again: Slowly turn your upper body, as if to look to the right. Then slowly return to facing forward and rest. Repeat this movement 2–4 times. Is there any improvement in your ease of movement as you turn? Can you see a little farther to the right? Rest a moment and notice: Does your left side feel more relaxed than your right side.

10. Keeping your feet flat on the floor, simply move your left knee forward slightly. Repeat this movement very slowly 6–10 times. After each movement, let your knee return to the starting position and rest. Relax your leg and reduce any unnecessary muscular effort. Notice how your left buttock and hip move forward a little. Feel how your head, eyes, and shoulders turn slightly to the right as the left knee moves forward.

11. Move your left knee forward while turning your head, eyes, and upper body to the right a little bit. Repeat this movement very slowly 6–10 times. Reduce unnecessary muscular effort and notice how your left hip moves forward as you turn. Do you feel any improvement in your ease of movement while turning? Can you see farther to the right? For comparison, turn to the right and then turn to the left. Feel the difference?[6]

Fig No. 2   **Fig No. 3**   **Fig No. 4**

3.2 Group B

Cranio-cervical flexion Exercise

1. Three repetitions of stretching exercises for neck flexor, extensor, lateral flexor, and rotator for 30 seconds as warm-up and cool-down exercises, in order to relieve tension on each side of the neck.

2. The first phase of training, the patient was asked to perform a slow and controlled cranio-cervical flexion action in the supine position.

3. Once the correct cranio-cervical flexion motion was achieved, the patients began the second phase of training in which they were trained to hold progressively increasing ranges of cranio-cervical flexion using feedback from an air-filled pressure sensor (Stabilizer Pressure Biofeedback, Chattanooga Group Inc., USA) placed behind the neck.

4. The feedback sensor displayed the amount of pressure change as the cervical lordosis progressively flatted during cranio-cervical flexion. The patient initially performed cranio-cervical flexion to sequentially reach 5 pressure targets, in 2 mmHg increments, from a baseline of 20 mm Hg to the final level of 30 mmHg.

5. The therapist identified the target level that the patient could hold steadily for 5 seconds without resorting to retraction without dominant use of the superficial neck flexor muscles, and without a quick, jerky cranio-cervical flexion movement.
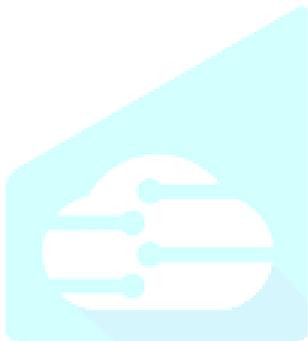

Fig No. 5

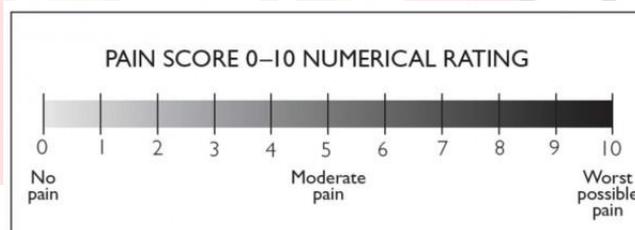### 3.3 Outcome Measures and Tools

▪ Numeric Pain Rating Scale

Fig No. 6

▪ Kinovea-Craniovertebral Angle - Forward Head Posture

Fig No. 7

III. STATISTICAL ANALYSIS

- Reduction in pain and improvement in Craniovertebral angle was assessed by NPRS and Kinovea software respectively.

- The data was entered in Excel spread sheet, tabulated and subjected to Statistical Analysis.

- The data entered was analysed using Instat software for checking Effectiveness Of Feldenkraise Method and Cranio-cervical Flexion Exercises For Neck Pain And Forward Head Posture In Undergraduate Students With Chronic Neck Pain.

- Data analysis was done for Group A (Feldenkraise Method) and Group B (Craniocervical flexion exercise) using outcome measures Numeric Pain Rating Scale (NPRS) and Craniovertebral Angle measurement (CVA).

- Pre and Post data analysis for NPRS and CVA was done for both Group A and Group B.

- Group A and Group B inter group analysis was done.

- Confidence interval was set at 95% and any value (p) less than 0.05 was considered as significant and any value (p) more than 0.05 was considered not significant.

Table No. 1: Gender–Wise distribution of Subjects in Numbers

GENDER	NUMBER
MALES	23
FEMALES	37

Graph No. 1: Gender–Wise distribution of Subjects in Numbers
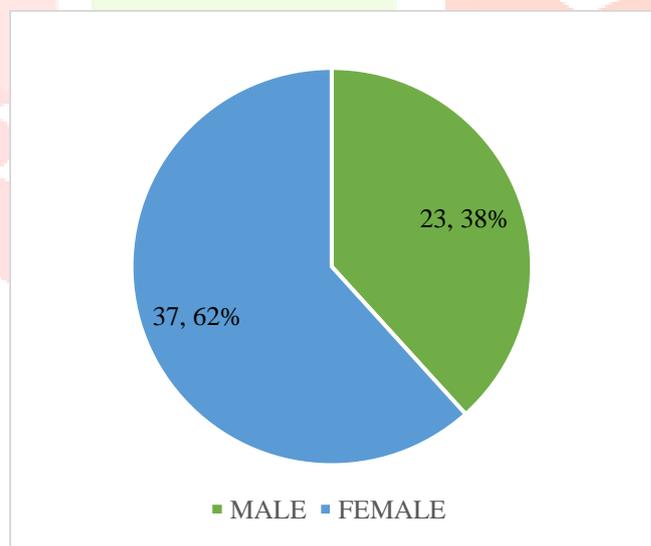

- MALE - FEMALE

Table No. 2: NPRS Values Pre and Post treatment in Group A and Group B

Outcome Measure/Group	MEAN SCORE PRE	MEAN SCORE POST	SD Value PRE	SD Value POST	t Value	p Value	Result
NPRS (A)	5	3.467	0.6948	0.8604	10.251	<0.05	Highly Significant
NPRS (B)	5.4	1.267	0.9685	1.048	31	<0.05	Highly Significant

Graph No. 2 : Comparison of NPRS score values Pre and Post treatment in Group A and Group B
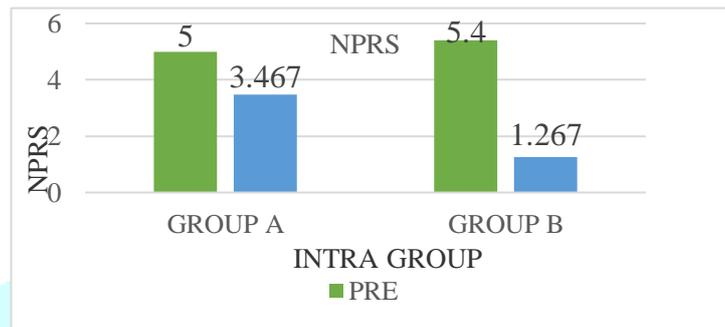

Table No. 3: CVA score values pre and post treatment in Group A and Group B

Outcome Measure/ Group	MEAN SCORE PRE	MEAN SCORE POST	SD Value PRE	SD Value POST	t Value	p Value	Result
CVA (A)	47.087	49.473	2.496	2.859	11.311	<0.05	Highly Significant
CVA (B)	46.49	51.06	3.399	3.49	39.269	<0.05	Highly Significant

Graph No. 3: Comparison of CVA score values pre and post treatment in Group A and Group B
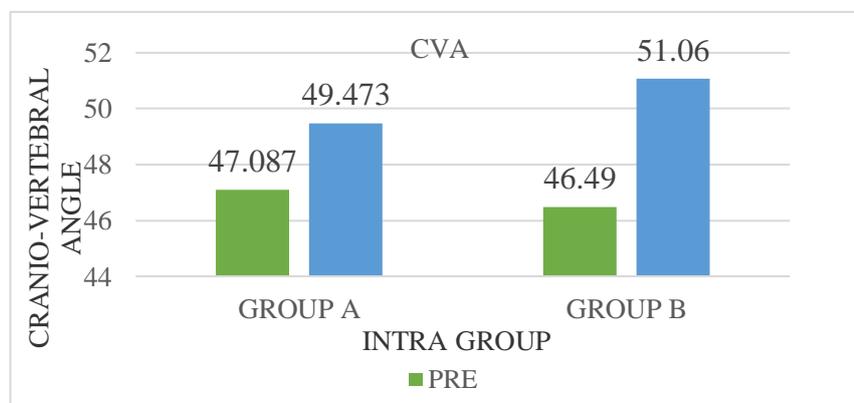
Table No. 4: Mean Difference of NPRS Score values in Group A and Group B

Outcome Measure	Group A		Group B		t Value	p Value	Result
	Mean Difference	SD Value POST	Mean Difference	SD Value POST			
NPRS	1.533	0.8604	4.133	1.048	8.886	<0.05	Highly Significant

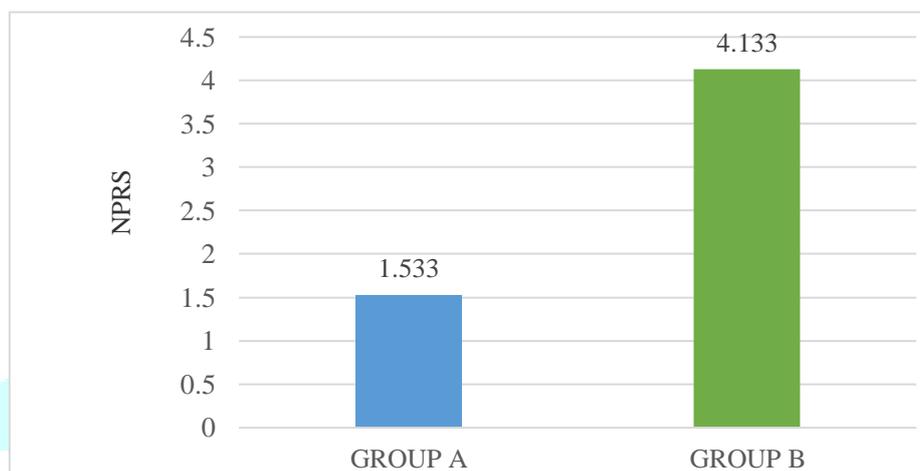**Graph No. 4: Representing Mean Difference of NPRS score values in Group A and Group B**

Table No. 5 Mean Difference of CVA score values in Group A and Group B

Outcome Measure	Group A		Group B		t Value	p Value	Result
	Mean Difference	SD Value POST	Mean Difference	SD Value POST			
CVA	2.387	2.859	4.57	3.49	1.926	<0.059	Quite Significant

Graph No. 5: Representing Mean Difference of CVA score values in Group A and Group B
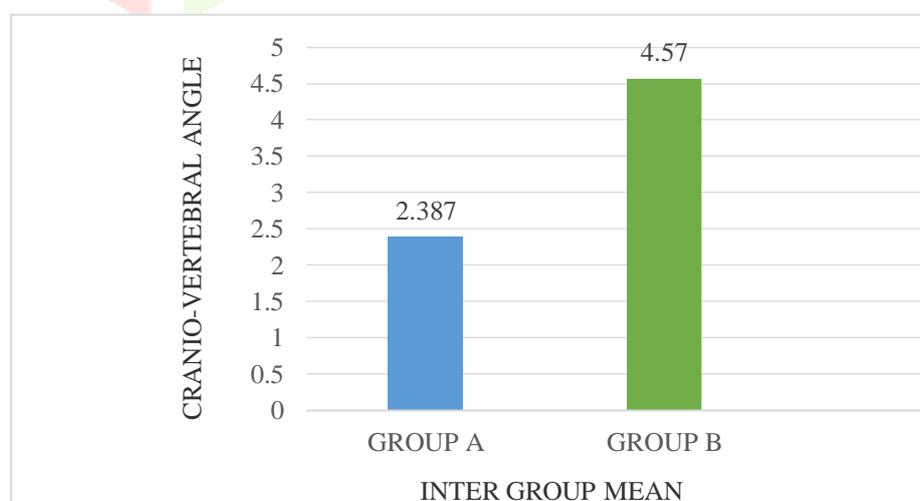
IV. RESULT

- 60 participants were included in the study.

- Mann-Whitney Test was used to compare the value of Numeric Pain Rating Scale (NPRS) before and after the treatment in group A and group B.

- Paired t-test was used to compare the value of Craniovertebral Angle (CVA) before and after the treatment in group A and group B.

- Unpaired t-test was used to compare the value of Post Numeric Pain Rating Scale (NPRS) between group A and B.

- Unpaired t-test was used to compare the value of Post Craniovertebral Angle (CVA) between group A and B.

- The p value obtained was <0.05 i.e. highly significant in group A for NPRS with pre treatment value 5 and post value as 3.467.

- The p value obtained was <0.05 i.e. highly significant in group B for NPRS with pre treatment value 5.4 and post value as 1.267.

- The p value obtained was <0.05 i.e. highly significant in group A for CVA with pre treatment value 47.087 and post value as 49.473.

- The p value obtained was <0.05 i.e. highly significant in group B for CVA with pre treatment value 46.49 and post value as 51.06.

V. DISCUSSION

The present study was carried out to compare the effectiveness of Feldenkraise Method and Cranio-cervical Flexion Exercise on Undergraduate students who are having neck pain and forward head posture. The study included Pre and Post values of subjects within 3 weeks of protocol in which 30 subjects were given Feldenkraise Method and 30 subjects were given Craniocervical flexion exercises.

Group A subjects were given Awareness Through Movement (ATM) variant of Feldenkrais Exercise along with conventional exercises and Group B subjects were given Craniocervical Flexion Exercises with conventional exercises.

The Feldenkrais Method is the way of learning – learning to move more freely and easily, to carry less stress in your body, to stop doing the things that cause pain. By slowing down and noticing how your body function, you gain feedback upon which your nervous system can build enhanced self-awareness and improved functioning.

David Zemach-Bersin, et.al stated that the Feldenkrais Method improves the way in which the brain coordinates posture and movement.[6] Ruth S, Kegerreis S. stated that ATM can enhance neck mobility and reduce discomfort associated with neck movements.[16] By promoting better alignment and functional movement patterns, ATM exercises could potentially address the underlying habits contributing to forward head posture.[17]

Mayoux-Benhamou MA, et.al concluded that Cranio-cervical flexion exercise (CFE) aimed at strengthening the deep neck flexor muscle, such as the longus capitis and colli, which are important in supporting the cervical region.[7] Craniocervical Flexion Exercises specifically target the muscles responsible for the movement and stabilization of the cervical spine (neck). The goal is to strengthen deep neck flexors, like the longus colli and longus capitis, and promote better posture by encouraging a more neutral or retracted head position.

Given the role of the deep cervical flexor muscles in postural support, a reduced ability to maintain upright posture of cervical spine might be considered as a measure of impairment in the postural supporting muscle during a functional task. Lluch E, Schomacher J, et.al concluded that strengthening deep cervical flexors can improve neck muscle function and reduce pain intensity over time.[18] Regular practice can result in a reduction of forward head posture, as the deep neck flexors become stronger and more efficient in controlling head positioning.

Craniocervical flexion exercises are more targeted towards improving neck strength and posture, making them more direct in addressing forward head posture. On the other hand, Feldenkrais works on body-wide awareness and movement, which might lead to broader, more holistic improvements in posture and pain relief.

VI. CONCLUSION

This study concluded that both the techniques are effective with higher significance but Craniocervical Flexion Exercise are more effective than Feldenkraise Method in reducing Neck Pain and improving Forward Head Posture among the Undergraduate students with Chronic Neck Pain.

VII. REFERENCES

1. Lloyd Long Yu Chan., Arnold Yu Lok Wong., Maggie Haitan Wang., et.al. The prevalence of neck pain and associated risk factors among undergraduate students: A large-scale cross-sectional study. Elsevier B.V.2020

2. Riddhi Dinesh Pasad., Dr. Abhijit N Satralkar., Effectiveness of Feldenkrais exercise on chronic neck pain, forward head posture and cervical spine range of motion in young patients with upper cross syndrome at the end of 3 weeks - An experimental study. International Journal of Applied Research.2020

3. SinHo Chung & Yeon-Gyu Jeong: Effects of the cranio-cervical flexion and isometric neck exercise compared in patients with chronic neck pain: A randomized controlled trial, Physiotherapy Theory and Practice.2018

4. Dae-Hyun Kim, Chang-Ju Kim, Sung-Min Son. Neck Pain in Adults with Forward Head Posture: Effects of Craniovertebral Angle and Cervical Range of Motion. Osong Public Health and Research Perspectives.2018.

5. Feldenkrais M. Embodied wisdom: The collected Papers of Moshe Feldenkrais. Somatic resources, ISBN. 2010.

6. David Zemach-Bersin, Mark Hirshfield. Feldenkrais Method: Stress-Free Exercise for People with Arthritis. Arthritis Self-Management, 2013, 15.

7. Mayoux-Benhamou MA, Revel M, Vallee C, Roudier R, Barbet JP, Bargy F 1994 Longus colli has a postural function on cervical curvature. Surgical and Radiologic Anatomy 16: 367–371.

8. Jull G, Falla D 2016 Does increased superficial neck flexor activity in the cranio-cervical flexion test reflect reduced deep flexor activity in people with neck pain? Manual Therapy 25: 43–47.

9. Jull G, Falla D, Vicenzino B, Hodges PW 2009 The effect of therapeutic exercise on activation of the deep cervical flexor muscles in people with chronic neck pain. Manual Therapy 14: 696–701.

10. Falla D, Jull G, Hodges PW, Vicenzino B 2006 An endurance-strength training regime is effective in reducing myoelectric manifestations of cervical flexor muscle fatigue in females with chronic neck pain. Clinical Neurophysiology 117: 828–837.

11. Borisut S, Vongsirinavarat M, Vachalathiti R, Sakulsriprasert P 2013 Effects if strength and endurance training of superficial and deep neck muscles on muscle activities and pain levels of females with chronic neck pain. Journal of Physical Therapy Science 25: 1157–1162.

12. Falla D, Jull G, Russell T, Vicenzino B, Hodges P 2007 Effect of neck exercise on sitting posture in patients with chronic neck pain. Physical Therapy 87: 408–417.

13. Lars-Olov Lundqvist, Christina Zetterlund, Hans O Richter. Effectives of Feldenkrais method on chronic neck/scapular pain in patients with visual impairment: A randomized Trail with one year follow-up. 2014; 95:1656-61.

14. K Kotteeswaran, K Rekha, Vaiyapuri Anandh. Effect of stretching and strengthening shoulder muscles in protracted shoulder in healthy individuals. 2012; 2:2250-1797

15. James Stephens and Susan Hillier. Evidence for the Effectiveness of the Feldenkrais Method. Human Kinetics.2020

16. Ruth S, Kegerreis S. Facilitating Cervical Flexion Using a Feldenkrais Method: Awareness through Movement. J Orthop Sports Phys Ther. 1992;16(1):25-9. doi: 10.2519/jospt.1992.16.1.25. PMID: 18796776.

17. Sheikhhoseini R, Shahrbanian S, Sayyadi P, O'Sullivan K. Effectiveness of Therapeutic Exercise on Forward Head Posture: A Systematic Review and Meta-analysis. J Manipulative Physiol Ther. 2018 Jul-Aug;41(6):530-539. doi: 10.1016/j.jmpt.2018.02.002. Epub 2018 Aug 11. PMID: 30107937.

18. Lluch E, Schomacher J, Gizzi L, Petzke F, Seegar D, Falla D. Immediate effects of active cranio-cervical flexion exercise versus passive mobilisation of the upper cervical spine on pain and performance on the cranio-cervical flexion test. Man Ther. 2014 Feb;19(1):25-31. doi: 10.1016/j.math.2013.05.011. Epub 2013 Jun 25. PMID: 23806488.