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A Comparative Study Between Effect of Proprioceptive Vs Conventional Training in Reducing Pain & Increasing Range of Motion in Chronic Neck Pain Patients

[1]Minal Chaudhary, [2]Dr. Sharda Sharma, [3]Corresponding Author- Prof. (Dr.) Niraj Kumar, [4]Dr Shama Parveen, [5]Dr. Tabussum

[1]Department of physiotherapy, Shri Guru Ram Rai University

[2]Associate Professor, Shri Guru Ram Rai University, Physiotherapy department, Shri Guru Ram Rai Institute of Paramedical and Allied Health Sciences,

[3]Ph. D (Physiotherapy), MPT, MHA, Professor of Shri Guru Ram Rai University, Physiotherapy department Shri Guru Ram Rai Institute of Paramedical and Allied Health Sciences, Patel Nagar, Dehradun, Uttarakhand

[4]Assistant Professor at Shri Guru Ram Rai University, Physiotherapy department, Shri Guru Ram Rai Institute of Paramedical and Allied Health Sciences

[5]Assistant Professor at Shri Guru Ram Rai University, Physiotherapy department, Shri Guru Ram Rai Institute of Paramedical and Allied Health Sciences

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KEYWORDS

NDI, VAS, ACROM, Conventional Therapy, Proprioceptive Training, Chronic neck pain.

ABSTRACT:

Introduction: Chronic neck is a prevalent musculoskeletal condition affecting individuals worldwide, often leading to decreased range of motion and diminished quality of life. It is characterized by persistent discomfort and functional limitations in the cervical region. The increasing prevalence of chronic neck pain is attributed to various factors, including sedentary lifestyles, poor ergonomics, and psychological stressors. This study presents a comparative investigation into the effects of proprioceptive training vs conventional training on increasing range of motion and reducing pain in patients with chronic neck pain.

Objectives: To improve range of motion and reduce pain in patients with chronic neck pain.

To assess the effectiveness of proprioceptive training and conventional training.

Methods: ll the participants were explained about the purpose of study. The subjects were screened for inclusion and exclusion criteria and then the baseline measurement was taken. An informed consent was taken from patients who were willing to participate in the study. Eligible subjects were randomly allocated into two groups. Group A participants receiving conventional training. Group B participants receiving proprioceptive training along with conventional training. Both groups had received exercises program for chronic neck pain. The study was of 6 weeks, 5 days per week at department of physiotherapy in SMIH. Examination include assessment which was performed on first and the last day of treatment & data was recorded in group A pre scoring was via VAS, NDI, cervical goniometer and after the scoring the patient undergone treatment with conventional and proprioceptive training.

Results: The data were analysed using the statistical software SPSS version 15. To analyse the difference of NDI, ACROM and VAS of Group A (Conventional therapy) and Group B (Proprioceptive training), the paired t- test was applied. The p values <0.0001 in Group A and Group B showing extremely significant.

Conclusions: Conventional therapy and proprioceptive training both shows improvement in range of motion and pain in chronic neck pain patients. But proprioceptive training shows more improvement in range of motion and pain in chronic neck pain after 6 weeks of therapy.

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1. **Introduction-** Chronic neck pain is defined as a debilitating condition characterized by persistent and widespread discomfort experienced in the neck and shoulder region. This condition is often accompanied by hyperalgesia, a heightened sensitivity to pain, which can be detected through palpation and observed in both passive and active movements of the neck and shoulder.[1]

It is a prevalent and burdensome musculoskeletal condition that affects a significant portion of the adult population. With a changing prevalence ranging from 43% to 66.7% in adults, chronic neck pain poses a considerable challenge to individuals worldwide.[2]

Neck pain is one of the most common persisting symptoms in the general population with anestimate lifetime prevalence of 67% among adults of age group 20 to 69 years. Limited rangeof motion and a subjective felling of stiffness may accompany neck pain, which is oftenprecipitated or aggravated by neck movements or sustained neck postures. Headache,brachialgia, dizziness and other signs and symptoms may also be present in combination ofneck pain. [3]

Cervical proprioception, in conjunction with visual and vestibular systems, plays a vital role in maintaining bodily balance, posture, and optimizing motor control. The cervical spine possesses a rich density of muscle spindles, contributing to a sophisticated proprioceptive system that governs neck reflex systems. These reflexes are essential for maintaining balance, coordinating head and eye movements, and ensuring equilibrium in both static and dynamic conditions. Individuals with various neck syndrome exhibit cervical proprioception, characterised by increased reposition errors compared to asymptomatic individuals. Such somatosensory dysfunction can lead to delays and errors in updating the information necessary to maintain balance. Furthermore, impaired proprioception significantly impacts postural stability across different diseases conditions.[4]

2. **Objectives-** To improve range of motion and reduce pain in patients with chronic neck pain. To assess the effectiveness of proprioceptive training and conventional training.

3. **Methods-** In this study simple random sampling technique was used and 30 patients were divided into two groups. 15 patients were selected randomly and was included in group A and 15 patients in group B. These subjects were solicited from the Shri Mahant Indiresh Hospital, Department of Physiotherapy, Patel Nagar, Dehradun (Uttarakhand) and selected according to inclusion and exclusion criteria. **Inclusion criteria:-** Age 18- 45 years, Neck pain persist for at least 3 months, Both sex groups and Patients with minimum 10% limitation in range of motion of neck rotation **Exclusion criteria:-** Patient with acute neck pain, Pain due to specific cause (e.g, fracture, spondylolisthesis, disc herniation and cervical stenosis), Neurological disorders, Orthopaedics disorders, Other systemic disease that may affect balance, History of any congenital anomalies and Pregnant woman.

Outcome Measures:- Neck Disability Index (NDI), Visual Analogue Scale (VAS) and Active Cervical Range Of Motion Device.

Procedure- All the participants were explained about the purpose of study. The subjects were screened for inclusion and exclusion criteria and then the baseline measurement was taken. An informed consent was taken from patients who were willing to participate in the study. Eligible subjects were randomly allocated into two groups. Group A participants receiving conventional therapy. Group B participants receiving proprioceptive training along with conventional therapy. Both groups had received exercise program for chronic neck pain. The study was of 6 week ,5 days per week at department of physiotherapy in SMIH. Examination included assessment which was performed on first and the last day of treatment & data was recorded.

In group A, the group A comprised of chronic neck pain subjects to be treated with conventional therapy. The conventional physiotherapy training program comprised hot pack (moist heat), Transcutaneous Electrical Nerve Stimulation (TENS), ultrasonic therapy and therapeutic exercises. Subjects first will receive hot pack (moist heat) for 10 mins before any other modality or exercise. Then subjects will be given treatment using TENS for 20mins at a frequency of 60 to 100Hz with 10- 30mA intensity. 5 mins ultrasonic therapy will be given on neck with 1.5 w\cm^2 intensity and at frequency of 1MHz. After that subjects will perform therapeutic exercises which will include cervical range of motion, and isometric exercises in sitting position by resisting at the forehead (cervical flexion, extension, rotation and side bending) for 10 sec with 15 sec breaks between holds with 10-15 repetitions.

In group B, comprised of chronic neck pain subjects to be treated with the proprioceptive training program along with conventional therapy. Gaze Direction Recognition Exercise (GDRE) program will be used to improve the proprioceptive balance of neck in chronic neck pain.

GDRE PROTOCOL INVOLVES: small boxes between 1 and 6 will be ordered on a table with the same interval to divide 5 equal parts for GDRE. A researcher sits towards the table at a distance of 75 cm. The patient sits behind the researcher at a distance of 75 cm and toward the table. The researcher looks the boxes randomly with cervical rotations. The patient at the back will tell which box the researcher looks at by saying number of the box. Exercises consisted of eye- follow, gaze stability, eye head coordination and position sense and movement sense. In eye-follow exercise, patients moved their eyes to follow the target

Journal of Chemical Health Risks
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while seated with their head stationary. The target was a pen held by physical therapist, who initially moved it slowly in one plane and then increased the speed and changed the direction of movement. For the gaze stability exercise, patients actively moved their head in all directions while visually fixing on the target. The exercise for eye- head coordination began by moving the head and eyes to the same direction. Then participants moved their eyes first to keep focused on the target, and then moved their head. Finally, they moved their eyes in one direction while simultaneously rotating their head in opposite direction. These exercises will be initially done slowly in a restricted range of movements, then the speed and range of movements gradually increased. Exercises will be done in both vertical and horizontal directions. For joint position sense and movement sense exercise, participants will wear a laser pointer attached to a head band. The participants will sit 1 meter from a point marked on the wall, and will be instructed to move their head until the laser beam was aimed on the point, and then close their eyes and memorize their head neck position for 5 sec. Maximal movements of the head will be performed in one direction (flexion, extension, rotation and lateral rotation flexion) after which the patients tried to recover their head position as closely as possible, and opened their eyes.

Figure 4.2 Performing cervical isometrics

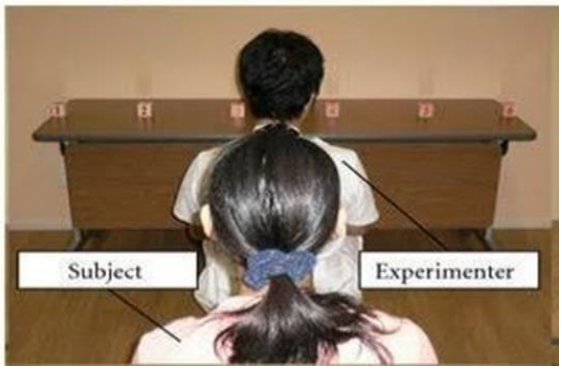

Figure 4.3 Performing Gaze Direction Recognition exercise

Figure 4.4 Patient performing joint position sense and movement sense exercise with laser pointer attached to the head band.

Figure 4.5 Applying Ultrasonic therapy

4. Results

This chapter deals with the result of data analysis of three outcome measures that is with NDI, ACROM, and VAS, within group A and group B and between group A and group B. The score was analysed and interpreted to determine which intervention is more effective in improving pain and range of motion in chronic neck pain patients.

Paired t- test was used to analyse and compared pre and post treatment score within the group A and group B. Analysing NDI revealed significant difference in group A post treatment, mean and standard deviation (21.13, 5.85) when compared to group A pre- treatment, mean and standard deviation of mean (28.93, 7.88) (table 6.1).

Analysing ACROM (flexion, extension, lateral flexion left, lateral flexion right, rotation left, rotation right) revealed significant difference in group A post- treatment, mean and standard deviation of mean (54.57, 4.69) (50.13, 3.07) (28.47, 5.73) (30.33, 4.37) (35.53, 3.72) (41.13, 3.23) when compared to group A pre- treatment, mean and standard deviation of mean (51.33, 5.25) (45.13, 3.07) (20.00, 2.67) (23.73, 2.34) (31.33, 2.00) (36.20, 2.88) (table 6.1).

Analysing VAS revealed significant difference in group A post treatment, mean and standard deviation (3.73, 1.33) when compared to group A pre- treatment, mean and standard deviation of mean (6.73, 1.49) (table6.1).

Journal of Chemical Health Risks
www.jchr.org
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Table 6.1: Within group comparison of pre and post data of all outcome measures in group A

CHRONIC NECK PAIN MESURED BY	MEAN	SD	t- VALUE	P- VALUE
PRE- NDI	28.93	7.88	14.0851	<0.0001
POST- NDI	21.13	5.85		
PRE- VAS	6.73	1.49	30.7409	<0.0001
POST- VAS	3.73	1.33		
PRE- ACROM (Flex)	51.33	5.25	14.3486	<0.0001
POST- ACROM (Flex)	54.67	4.69		
PRE- ACROM (Ext)	45.13	3.07	4.4639	<0.0001
POST- ACROM (Ext)	50.13	3.07		
PRE- ACROM (LFL)	20	2.67	6.1833	<0.0001
POST- ACROM (LFL)	28.47	5.73		
PRE- ACROM (LFR)	23.73	2.34	6.1789	<0.0001
POST- ACROM (LFR)	30.33	4.37		
PRE- ACROM (RL)	31.13	2	6.0906	<0.0001
POST- ACROM (RL)	35.53	3.72		
PRE- ACROM (RR)	36.2	2.88	7.5808	<0.0001
POST- ACROM (RR)	41.13	3.23		

Analysing NDI revealed significant difference in group B post treatment, mean and standard deviation (20.93, 6.64) when compared to group B pre- treatment, mean and standard deviation of mean (227.67, 8.40) (table 6.2).

Analysing ACROM (flexion, extension, lateral flexion left, lateral flexion right, rotation left, rotation right) revealed significant difference in group B post- treatment, mean and standard deviation of mean (58.76, 5.38) (52.53, 4.05) (32.40, 5.72) (32.73, 3.06) (37.21, 1.70) (41.47,1.92) when compared to group B pre- treatment, mean and standard deviation of mean (51.57, 4.91) (46.93, 4.11) (24.40, 5.37) (24.60, 1.88) (31.47, 1.68) (35.80, 1.82) (table 6.2).

Analysing VAS revealed significant difference in group B post treatment, mean and standard deviation (3.80, 1.78) when compared to group B pre- treatment, mean and standard deviation of mean (6.73, 1.58) (table6.2).

Table 6.2: Within group comparison of pre and post data of all outcome measures in group B

CHRONIC NECK PAINMESURED BY	MEAN	SD	t- VALUE	P- VALUE
PRE- NDI	27.67	8.40	12.2998	<0.0001
POST- NDI	20.93	6.64		
PRE- VAS	6.73	1.58	9.2908	<0.0001
POST- VAS	3.80	1.78		
PRE- ACROM (Flex)	51.57	4.91	8.5078	<0.0001
POST-ACROM (Flex)	58.76	5.38		
PRE- ACROM (Ext)	46.93	4.11	13.6011	<0.0001
POST-ACROM (Ext)	52.53	4.05		
PRE- ACROM (LFL)	24.40	5.37	11.5931	<0.0001
POST-ACROM (LFL)	32.40	5.72		
PRE- ACROM (LFR)	24.60	1.88	10.9559	<0.0001
POST-ACROM (LFR)	32.73	3.06		
PRE- ACROM (RL)	31.47	1.68	17.3494	<0.0001
POST-ACROM (RL)	37.21	1.70		
PRE- ACROM (RR)	35.80	1.82	17.7790	<0.0001
POST-ACROM (RR)	41.47	1.92		

Journal of Chemical Health Risks
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The data were analysed using the statistical software SPSS version 15. To analyse the difference of NDI, ACROM and VAS of Group A (Conventional therapy) and Group B (Proprioceptive training), the paired t- test was applied. The p values <0.0001 in Group A and Group B showing extremely significant.

Table-6.3: Mean Difference in NDI, ACROM and VAS in between Groups A & B

	GROUP A			GROUP B		
	NDI	**ACROM**	**VAS**	**NDI**	**ACROM**	**VAS**
Mean difference	21.13	Flex- 54.67 Ext- 50.13 LRL- 28.47 LRR- 30.33 RL- 35.53 RR- 41.13	3.73	20.93	Flex- 58.67 Ext- 52.53 LRL- 32.40 LRR- 32.73 RL- 37.20 RR- 41.44	3.80
SD	5.85	Flex- 4.69 Ext- 3.07 LRL- 5.73 LRR- 4.37 RL- 3.72 RR- 3.23	1.33	6.61	Flex- 5.38 Ext- 4.05 LRL- 5.72 LRR- 3.06 RL- 1.70 RR- 1.92	1.78
t- Value	0.087	Flex- 2.17 Ext- 1.82 LRL- 1.88 LRR- 1.74 RL- 1.58 RR- 0.35	0.122	0.087	Flex- 2.17 Ext- 1.82 LRL- 1.88 LRR- 1.74 RL- 1.58 RR- 0.35	0.122
p- Value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

The result of Group A and Group B showing differences at p values <0.0001. As comparing the mean difference between both groups, the mean difference in NDI for group A is 21.13 and Group B is 20.93, this result showed that Group A is more effective in NDI as compared to Group B. On the other hand, while comparing the mean difference between both the group A and B in ACROM and VAS. Group A showed (flex- 54.67) (Ext- 50.13) (LRL- 28.47) (LRR- 30.33) (RL- 35.53) (41.13) and VAS (3.73), and Group B ACROM (flex- 58.67) (Ext- 52.53) (LRL- 32.40) (LRR- 32.73) (RL- 37.20) (RR- 41.44) and VAS (3.80) that indicated that the Group B is more effective in ACROM and VAS than Group B (table 6.3).

Therefore, result suggest that after 6 weeks of conventional therapy and proprioceptive training, both groups shows improvement in pain and range of motion but proprioceptive training shows more improvement in pain and range of motion of neck in chronic neck pain patients.

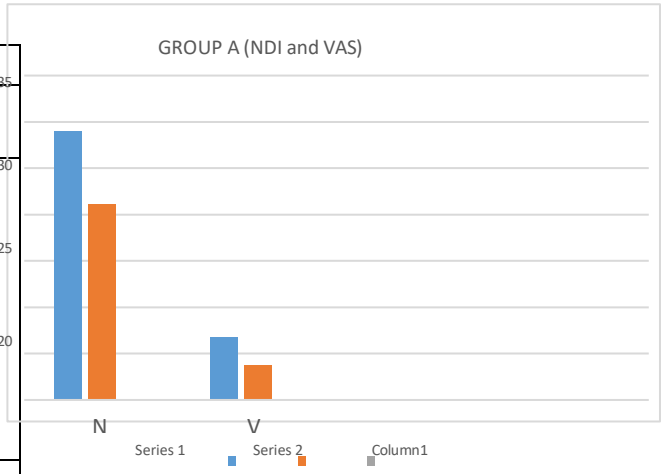

Figure 6.1 Mean Of Group A (NDI and VAS)

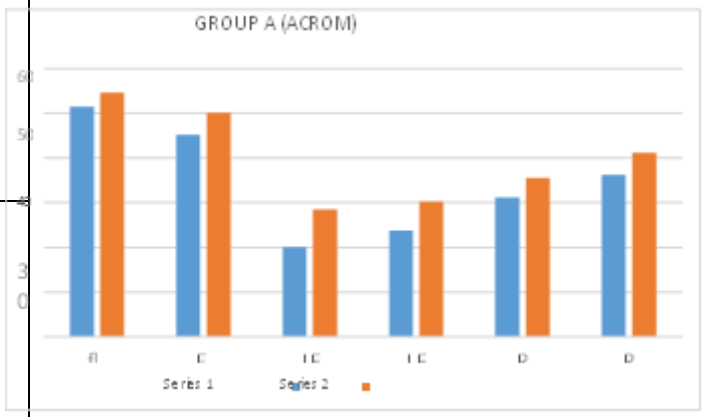

Figure 6.2 Mean Of Group A (ACROM)

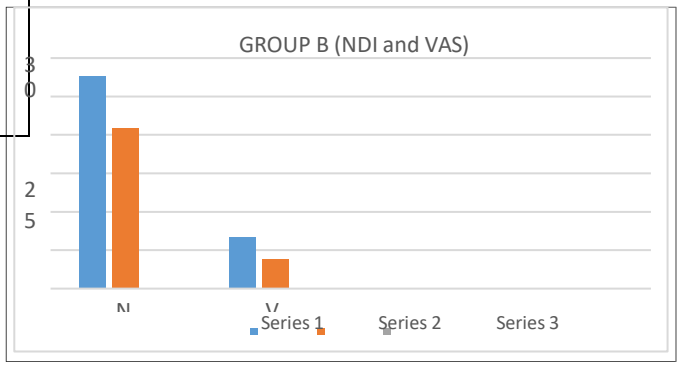

Figure 6.3 Mean Of Group B (NDI and VAS)

Journal of Chemical Health Risks

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JCHR (2024) 14(2), 644-650 | ISSN:2251-6727

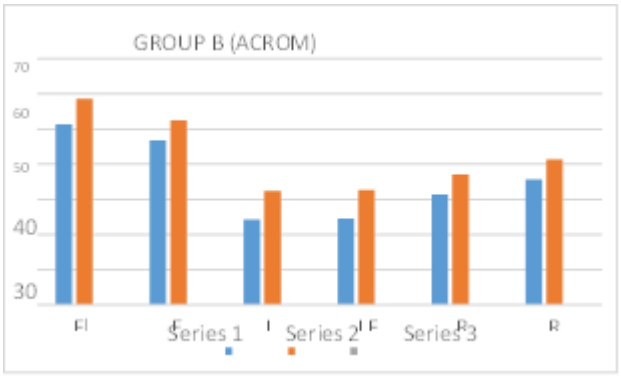

Figure 6.4 Mean Of Group B (ACROM)

5. Discussion

The present study aimed to investigate the effects of proprioceptive training compared to conventional therapy on increasing range of motion and reducing pain in chronic neck pain patients. The result of this study demonstrate a significant advantage of proprioceptive training over conventional therapy in achieving these objectives.

Our findings align with previous studies that have highlighted the importance of proprioceptive training in improving motor control and kinaesthetic awareness. The proprioceptive system plays a crucial role in maintaining postural stability and joint function, and deficits in proprioceptive have been linked to various musculoskeletal conditions, including neck pain. The observed superiority of proprioceptive training in our study may be attributed to its targeted engagement of proprioception, muscle activation, and sensorimotor integration.

Comparative studies investigating the efficacy of conventional therapy have shown varying outcomes, and some have reported modest improvements in range of motion and pain reduction. However, its important to note that conventional therapy often encompasses a wide range of interventions, making direct comparisons challenging. The homogeneity and specificity of proprioceptive training in our study could have contributed to the more pronounced effects observed.

Mechanistically, proprioceptive training likely influences pain reduction through improved neuromuscular control and joint stability. Enhanced proprioception can help patients adopt more optimal movement patterns, reducing stress on affected structures and subsequently alleviating pain.

The clinical implications of our findings are noteworthy. Incorporating proprioceptive training into the rehabilitation protocol for chronic neck pain patients has the potential to enhance treatment outcomes.

Proprioceptive exercises can be tailored to target specific neck muscles and movement patterns, leading to more focused and effective interventions. Moreover, as proprioceptive training involves active patient engagement, it may promote self-management and long term adherence to exercises.

Despite the promising results, several limitations warrant consideration. The sample size in this study was relatively small, and the duration of the intervention was limited. Additionally, the specific exercises and protocols used in both training methods could influence the outcome.

Future research with larger sample sizes, longer intervention periods, and different exercises variations would provide a more comprehensive understanding of the long- term effects.

In conclusion, the present study contributes to the growing body of literature on proprioceptive training and its impact on chronic neck pain. Our findings support the notion that proprioceptive training is more effective than conventional therapy in increasing range of motion and reducing pain in this patient population. This insight underscores the importance of considering proprioceptive interventions in the design of rehabilitation programs for chronic neck pain. Further research and clinical implementation of proprioceptive training are warranted to optimize treatment strategies and improve the quality of life for individuals with chronic neck pain.

6. Conclusion

Conventional therapy and proprioceptive training both shows improvement in range of motion and pain in chronic neck pain patients. But proprioceptive training shows more improvement in range of motion and pain in chronic neck pain after 6 weeks of therapy.

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