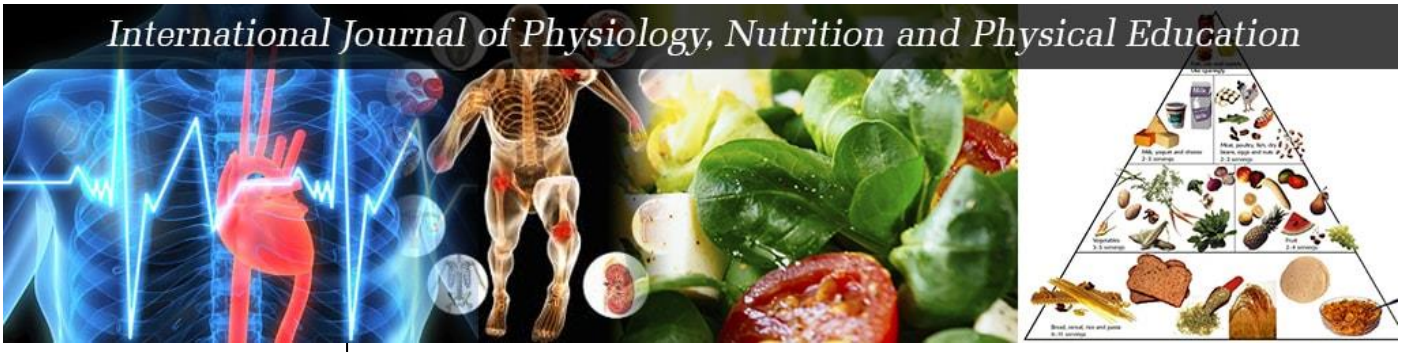

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Efficacy of dorsal spine manipulation and cranio-cervical flexion in two selected postures in non-specific neck pain

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Abstract
Background: The endeavour of this study was to examine the effectiveness of thoracic or dorsal spine manipulation over cranio-cervical flexion in two postures in subjects with mechanical neck pain and to find the improvement in pain, disability, forward head posture and endurance**.** An experimental set up for four training groups of thoracic manipulation, deep neck flexors, cranio-cervical flexors in prone on elbow and isometric neck groups was done.
Methods: The subjects with a history of neck pain reporting to physiotherapy department were scrutinized for inclusion & exclusion criteria. The subjects undergone intervention in one of the four groups for 6 sessions within 1-week duration. After 6th session of intervention, treatment data were collected.
Results: There was a significant difference in the result of VAS scale between the groups based on the test. There was a minimal difference seen in the neck functional disability scale by Copenhagen between the groups and the time score or endurance between two selected postures. The inter group analysis showed significant difference in the mean values of the outcome measures.
Conclusion: Among the patients who underwent a protocol for mechanical neck pain for 6 sessions for a week showed statistically significant and clinically relevant improvement in their active daily living functions. Cranio-cervical flexion in sphinx position (prone on elbow) found to be more effective than cranio-cervical flexion in supine and self-resisted isometric neck strength training on pain, disability and forward head posture in subjects with nonspecific mechanical neck pain.

Keywords: Dorsal spine manipulation, mechanical neck pain, cranio-cervical flexion, VAS scale, Copenhagen neck functional disability scale

Introduction
Non-specific neck pain occurs when one of the joints in the spine loses its normal joint play i.e., resiliency and shock absorption property. It is the general term that refers to any type of back pain caused by placing abnormal stress on muscles of the vertebral column, which results from bad habits such as poor posture, poorly designed seating, and incorrect bending and lifting motions [1].
Many times, non-specific neck pain is associated with headaches that may radiate into the base of the skull, side of the head or periorbital region. These type headaches referred as cervicogenic headaches [2]. The incidence of chronic neck pain noticed higher in women (15%) than men (9%). Women have the highest incidence at the age of 45 and men at the age of 60 years [3].
The effect of mobilization as well as manual therapy on subjects with chronic neck pain not due to whiplash or without arm pain and headaches has shown positive effect [4, 5]. Other methods of treatment like massage, manipulative trusts, alternative therapies and inhibition techniques also shown improvements in the non-specific neck pain [6-9].

Objectives of study
- To find the improvement in pain, disability, forward head posture and endurance with high velocity thrust thoracic manipulation in subject with non-specific neck pain.

- To find the improvement in pain, disability, forward head posture and endurance with isometric neck exercise in subject with non-specific neck pain.
- To find the improvement in pain disability, forward head posture and endurance with supine CCF (cranio-cervical flexors) using pressure biofeedback in subject with non-specific neck pain.
- To find the improvement in pain disability, forward head posture and endurance with CCF in sphinx position.

Materials and Methodology

The materials used for this study were –Bed, pillow, pressure biofeedback device, tennis ball, micro pore, stopwatch, VAS scale used to access the pain before and physiotherapy intervention, data collection sheet and Copenhagen neck function disability questionnaire.

Study Design: intervention study

Sampling Method: purposive sampling study

Sample Size: 60 subjects divided into two groups. Group A: 30 subjects Group B: 30 subjects.

Tools Used: Copenhagen neck functional disability questionnaire (CNFDQ), Visual analogue scale (VAS), Stopwatch

Inclusion criteria

- Subjects with mechanical neck pain.
- Pain level of mild to moderate: VAS < or = 6
- Age 20 to 50 years.
- Inability to perform ADL without pain

Exclusion criteria

Subjects with non-musculoskeletal pain, signs of neurological involvement, cervical disc prolapsed, spinal stenosis, previous neck surgery, history of cervical trauma, history of whiplash disorder, spasmodic torticollis, frequent migraine, peripheral nerve entrapment, fibromyalgia, non-cooperative patient, carcinoma, cervical radiculopathy.

Procedure

Subjects were screened as per inclusion and exclusion criteria. An informed consent from each subject obtained in written form before commencement of interventions. After the demographic data collection, participating subjects were evaluated in detail for the study needs with special emphasis on the quantification of pain profile by using Visual analogue scale, endurance of neck flexion using a stopwatch, and disability level by Copenhagen Neck Function Disability Questionnaire (CNFDQ). After these, all subjects were allocated to two groups, Group A and Group B, and for this purpose, randomization was done.

Then all the subjects in Group A were given High velocity thoracic thrust manipulation, isometric neck contraction and performed craniocervical flexion test in supine position. On the other hand Group B was treated with High velocity thorarcic thrust manipulation, isometric neck contraction and craniocervical flexion test in prone lying. Both the groups were treated for 6 sessions for 1 week. *Subjects in Group A* were treated with a common protocol of High velocity thoracic thrust in which the patient was placed in prone position with head in neutral position. The chin supported on bed. Hands were placed relaxed on both sides. Then, the patient was asked if he/ she was comfortable or not. The therapist in the meantime, placed himself on the couch upon the patient. The patient was asked to inhale slowly through nose and exhale out slowly but completely. Therapist then put his thenar and hypothenar eminence over the desired thoracic level. The therapist then exerted pressure over the first exhalation and then increased with the second one. At the end of the third exhalation, the therapist applied the high velocity thrust to the desired thoracic level when the patient had completely exhaled out. Then this group was treated with isometric neck contractions, the subjects were instructed to do isometric contraction for neck flexors, extensors, and side flexors. The subject were instructed to use both hands to press the forehead (backward force) and the subject would resist the force actively by not letting go the flexor contraction. Similarly, hands were placed over back of head and over temples to resist Isometric contractions of neck extensors and lateral flexors respectively. The instructions to the subject was "Attempt to push your head backward but do not let your head move" and "Attempt to push your head sideways but do not let your head move" respectively.

- **Repetition:** 10 times for flexion, extension, side flexion to left and right, rotations to both the side.
- **Hold time:** 10 seconds
- **Rest interval:** 1 minute between each movement.

Lastly, craniocervical flexion test was done for the deep neck flexor in supine lying position wherein subjects were placed in supine crook lying with neck in neutral. The subject were instructed to put the tip of tongue over the upper palate and nod the head in to flexion. The performance was guided by feedback from an air filled pressure sensor placed behind the neck, to monitor subtle flattening of the cervical lordosis, which occurred with the contraction of longus coli. The subjects were instructed to raise the level of pressure in pressure biofeedback (PBFB) device from 20 mm Hg to 22 mm Hg and hold for 5 seconds. The subjects were facilitated to hold the target pressure without activating superficial neck muscles and without fluctuations. Isometric hold was performed for 5 seconds x 10 repetitions, with rest intervals of 10 seconds between repetitions. Similarly, three sets were given with gradual progression. If the subject was able to hold for 10 seconds with each of 10 repetitions, the target pressure was incremented by 2 mmHg. Patients would attempt to target progressive 2mm of Hg pressure increments from a base line of 20mm of Hg to the final target of 30 mm Hg [10].

- 5 sec hold 10 sec rest – 10 repetitions were done
- 3 sets
- Rest interval: 1 minute between each difficulty level
- 10 sec hold 20 sec rest – 3 sets
- Subject were taken to next target level.

All the subjects in Group B, were also treated with the common protocols of High velocity thrust and isometric neck contractions. However, in this group the craniocervical neck flexion was now done in prone on elbow position. Here the subjects were trained to perform 'chin tucks' in supine lying position as a part of familiarization of procedure. As the experimental treatment, the 58 subject were positioned in sphinx position (prone on elbow) with shoulder protracted & neck in neutral. A command was given to "Tuck in your chin and hold" which was given to them by the instructor. This position was maintained for 10 seconds.

- 10 second hold x 10 repetition x 3 set (per session)

- Rest interval of 1 minute between each series. All these treatment was continued for 6sessions for 1 week. At the end of last day of treatment, pain in visual analogue scale, disability level as CNFDQ, and endurance of deep neck flexors in time in seconds, were assessed and noted [11, 12].

Statistical analysis

Descriptive statistics (mean ± standard deviation) were determined for the directly measured and derived variables to quantify the clinical evaluation, pain, neck endurance, and score of disability. Student's t-test was applied to compare the data between TWO GROUPS. All the data were determined using SPSS (Statistical Package for Social Science) version 21.0. A 5% level of probability was used to indicate statistical significance.

Results

Table 1: Descriptive statistics of the demographic profile of group A and group B

Variables	Group A		Group B		t value	p value
	Mean	SD	Mean	SD		
Age(years)	34.80	6.213	34.73	6.135	0.30	.977
Height(cm)	168.60	4.968	171.80	5.570	1.660	.108
Weight(kg)	69.83	6.691	70.80	4.830	-.512	.611

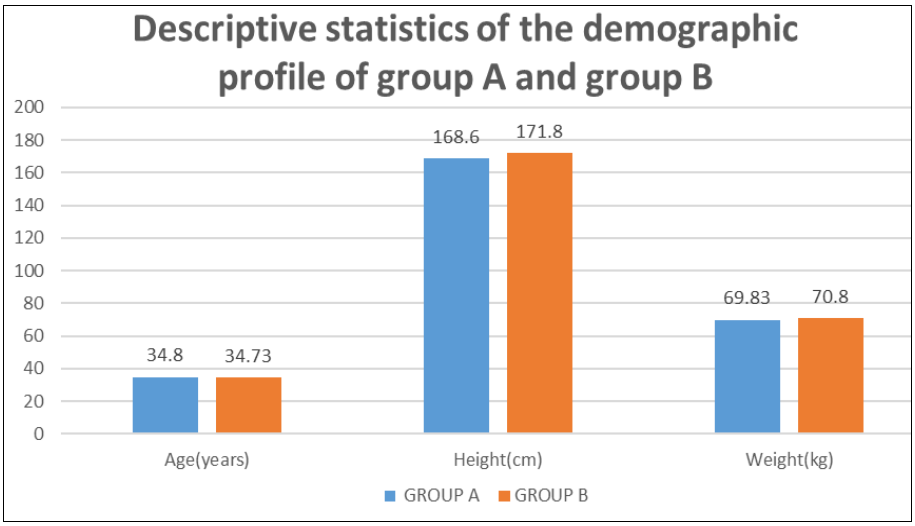

Table 2: Gender distribution profile of group A and group B

Serial No	Gender	Group A (n =30)	Group B (n =30)
1.	Male	13	18
2.	Female	17	12

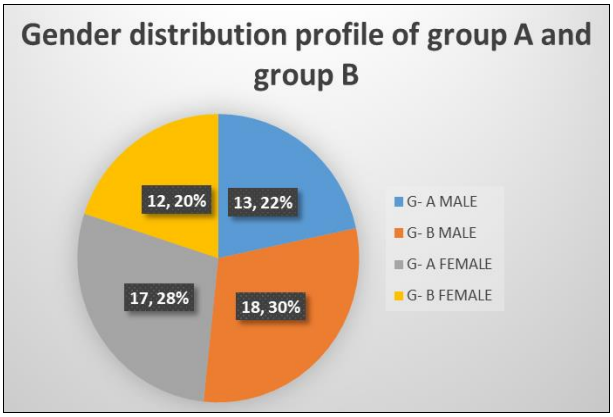

Table 3: Analysis of Visual Analogue Scale (VAS)

Parameters	Group A		Group B		t value	p value
	Mean	SD	Mean	SD		
PRE (VAS)	8.21	0.94	7.9	0.95	1.271	0.512
POST(VAS)	4.73	0.58	3.03	1.29	6.583	0.001
DIFF. VAS	3.48	0.36	4.9	-0.34	15.70	0.001

Table 4: Analysis of Copenhagen Neck Functional Disability Scale

Parameters	Group A		Group B		t value	p value
	Mean	SD	Mean	SD		
PRE (CNFDS)	18.4	1.94	19.1	1.76	0.503	0.619
POST(CNFDS)	9.93	1.52	11	1.98	5.949	0.001
DIFF (CNFDS)	8.5	0.41	8.1	-0.21	4.424	0.001

Table 5: Analysis of Endurance in Seconds

Parameters	Group A		Group B		t value	p value
	Mean	SD	Mean	SD		
Pre	3.6	1.24	3.5	1.13	0.327	0.838
Post	7.56	1.0	7.9	0.86	1.412	0.001
Difference	3.96	0.24	4.4	0.26	6.811	0.001

Discussion

Recent studies have identified the correlation between mobility at the cervico thoracic junction thoracic spine with neck shoulder pain. Moreover, a decrease in mobility of cervical spine is significantly related to neck pain because of biomechanical links between the thoracic spine and cervical spine. The reason why the group treated with thoracic mobilization showed greater improvement according to all measured parameters can be found. In the studies in indicating that cervico thoracic motions are related to neck shoulder pain. It is also possible that impaired mobility in the thoracic spine may be a contributor to mechanical neck pain. Therefore, although this study identify the range of joint motions, we think that recovery of mobility achieved by thoracic mobilization affected all the measured parameters. Earlier studies indicated the manual therapy interventions to the spine were effective in alleviating pain occurring in areas distal to the area being directly treated. It has also been reported that the reason why manual therapy conducted on spine shows alleviation of pain is that it show inhibition mechanism. Thoracic manipulation contributed to recovery of normal biomechanics, thereby reducing mechanical stress in cervical spine and improving the distribution of joint force. It is also possible that spinal manipulative therapy has inherent qualities that can alter the biomechanics of thoracic spine and it is likely that the affected segments are biomechanically

related to the cervical spine the cervical flexors exercises and thoracic mobilizations, performed with patients with neck pain, yielded greater therapeutic effects. This could be seen in terms of reduced pain and improved disability index. This improvement might be the result of reducing excessive load on the craniocervical extensors which was achieved by increased mobility of the cervico-thoracic junction by the application of additional thoracic mobilization, increasing muscle strength with deep flexor muscle strengthening exercises. One study reported that manual therapy approaches induce reflex, inhibitions of pain or reflex muscle relaxations by modifying the discharge of proprioceptive afferents.

Conclusion

The result suggested that combination of thoracic manipulation with isometric neck contra -ctions with craniocervical flexion in two positions of disability for both the groups showed significant effectiveness in increasing the deep neck flexor muscles endurance, VAS in pain and neck functional disability index score. The results of the study suggested that there was significant difference between the difference in mean values of pain and disability between group-A&B. The findings also suggested that there was significant difference within group-A, group-B for pain and disability.

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