

Effectiveness of Pilates and Gong's Mobilization on Pain, Range of Motion and Function in Text Neck Syndrome Among Young Adults

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ABSTRACT

PURPOSE: The purpose of the study was to find the effectiveness of Pilates and Gong's Mobilization on Pain, Range Of Motion and Function in Text Neck Syndrome among young adults.

METHODS: In this Quasi-experimental study there were 60 subjects with an average age of 18 to 24 years of age. The subjects were divided in to 2 groups by Convenience sampling method. The subjects in Group A (n = 30) received Pilates Exercises, while the subjects in Group B (n = 30) received Gong's Mobilization. Intervention was given to participants for 5 sessions a week for six weeks. VAS for Pain, Goniometer for Range of Motion and NDI for function were used to assess the intervention's effectiveness.

RESULTS: Independent 't' test was used to compare the mean significance difference between continuous variables. Paired 't' test was used to assess the statistical significance difference between pre and post test scores. Statistical analysis of this data revealed that, both groups significantly improved in both parameters when compared within groups, but when compared between groups, the Pilates group improved better than the Gong's mobilization group.

CONCLUSION: According to the results of the present study, six weeks interventions of both the Pilates and Gong's Mobilization Groups have shown significant improvement in reducing Pain, Improving Range Of Motion and Function in Text Neck Syndrome. However, Pilates Group has shown better improvement when compared to Gong's Mobilization Group.

KEY WORDS: Text Neck Syndrome, Pilates, Gong's Mobilization.

INTRODUCTION

The term Text Neck is used to describe a repetitive stress injury where a person has his/her head hung flexed forward and bent looking at his mobile or any other electronic devices such as laptop, tablets etc. for prolonged period of time¹.

The term Text Neck Syndrome was coined by DR. Dean L Fishman a US Chiropractor as an overuse injury or a repetitive stress injury due to poor posture, he founded the Text Neck institute in plantation Florida leading the way and breaking new ground.

DR. Fishman is a pioneer in treating technology related injuries².

A study reported that 79% of the population in the age group 18 to 24 years spend their most of the time texting in their electronic devices. In 21st century the advancement in the technology has brought people together by using smart phones they spent most of the time in social media this result in flexion of neck for prolonged period of time^{3,4}.

Most smart phone users stare sharply downwards to read the screen of the mobile which makes their head forward and cause

an excessive anterior curve in the lower cervical vertebrae and an excessive posterior curve in the upper thoracic vertebrae to maintain balance placing stress on cervical spine and neck muscles Forward Head Posture and Protracted Shoulder are most commonly recognized poor postures⁵. Forward Head Posture is characterized by hyper extension of upper cervical spine (c1-c3) and flexion of lower cervical spine (c4-c7) and is associated with shortening of upper trapezius and posterior cervical extensor muscles and levator scapular muscles⁶.

Repeated stress to the flexed neck may also cause shoulder Pain, chronic headache if this condition is untreated may result in earlier arthritis permanent damage and result in Overuse Syndrome⁷.

The weight of the head on spine is increased when it is flexed forward and the amount of weight are strongly increased by varying degrees. Tilting the head forward to 15 degrees places about 27 pounds of force on the neck this increase to 40 pounds at 30 degrees, 49 pounds at 45 degrees and 60 pounds at 60 degrees⁸.

Not only the degree of neck flexion is relevant but also the frequency of head bending induces effects on the neck. The frequent forward flexion can change the cervical spine curvature supporting ligaments, tendons musculature, commonly causing postural change and pain on the neck areas^{9,10}.

Clinical assessment of Text Neck Syndrome is done through observation of the position of the head relative to the reference anatomical landmarks. Radiographic techniques can be used to measure postural angles¹¹.

The Craniovertebral angle is one of the most reliable methods and common angles for evaluating the Forward Head Posture. It examines head status relative to the seventh cervical vertebrae (c7)^{12,13}.

The Craniovertebral angle was identified at the intersection of a horizontal line passing through the c7 spinous process and a line joining the midpoint of the tragus of the ear

to the skin overlying the c7 spinous process. A smaller CVA indicates a greater FHP and a CVA less than 50° were defined as FHP¹⁴. Prevention is the key to Text Neck Syndrome by maintaining the posture and avoiding excessive usage and taking frequent breaks¹⁵.

Rehabilitation is found to be very effective in treating the stress injury resulting from Text Neck. The exercises include strengthening and stretching exercises^{16,17}, scapular stabilization exercises, elastic band exercise, cervical stabilization exercises, posture retraining exercises etc^{18,19,20}

Pilates is described as unique technique which is used widely in recent years for both fitness and rehabilitation sectors. It includes both physical and mental training along with breath control. Joseph Pilates teaching pays special attention to the muscles that stabilizes the joints thus encouraging correct body mechanics it is combination of muscle lengthening and strengthening along with breath control in order to develop core muscles, restore muscle balance, fitness flexibility and posture^{21,22}.

The key elements of these modified Pilates include activation of the lumbo-pelvic stabilizing muscles, correct ribcage/thoracic alignment, scapula-thoracic stabilization and lateral costal breathing. Pilates also encourages activation of the deep neck flexor muscles by encouraging a neutral position of the cervical spine with slight upper cervical flexion at the cranio-cervical junction^{23,24}.

Gong's Mobilization Technique is end range mobilization technique. Wontae gong found the Gong's Mobilization Technique it is useful treatment in clinical setting because of its immediate effect. It aims to decrease pain and improves range of motion²⁵.

The feature of Gong's Mobilization is that a neutral position of cervical area is established first before beginning Mobilization and also that when the mobilization is included on the fixed facet joint used the principles of three point

pressure the movements of the facet other than the fixed ones are maximally restricted and mobilization is included using gravity and acceleration²⁶.

AIM OF THE STUDY

The aim of the study was to assess effectiveness of Pilates and Gong's Mobilization on Pain, Range of Motion and Function in Text Neck Syndrome among young adults.

OBJECTIVES OF THE STUDY

1. To determine the effectiveness of Pilates on Pain, Range of Motion and Function in Text Neck Syndrome among young adults.
2. To determine the effectiveness of Gongs Mobilization on Pain, Range of Motion and Function in Text Neck Syndrome among young adults.
3. To compare the effectiveness of Pilates and Gongs Mobilization on Pain, Range of Motion and Function in subjects with Text Neck Syndrome among young adults

HYPOTHESIS

RESEARCH HYPOTHESIS

Pilates Exercises is more effective than Gong's Mobilization on Pain, Range of Motion and Function in Text Neck Syndrome among young adults.

ALTERNATE HYPOTHESIS(Ha)

Gong's Mobilization is more effective than Pilates on Pain, Range of Motion and Function in Text Neck Syndrome among young adults.

NULL HYPOTHESIS (Ho)

There is no significant difference between Pilates and Gong's Mobilization on Pain, Range of Motion and Function in Text Neck Syndrome among young adults.

REVIEW OF LITERATURE

Jill Shah, Krupa Soni et, al 2021; has done a study on "Effectiveness of Pilates along

with conventional exercise program and conventional exercise program alone in subjects with text neck syndrome on two groups of total number of 30 subjects each. The aim of the study was to find the effectiveness of Pilates versus conventional exercise program in students with text neck syndrome and determine the better of these for better benefit of patients. It is a Quasi-experimental study conducted in which 30 participants with the features of text neck syndrome were studied for 6 week intervention. They were divided in to 2 groups by convenience sampling Group - A: conventional exercise program and Group-B: Pilates along with conventional exercise program. A significant improvement in Pain, Disability, Muscle strength, and Endurance after the treatment was found in both groups. Greater statistically significant improvement was seen in group B as compared to group A. Thus, the study concluded that Pilates along with conventional exercise program was more effective in treating patients with Text Neck Syndrome.

International Journal Of Science And Research Volume 10 Issue 3, March 2021.

Daniela David, Cosimo Giannini et, al, 2021; has done a study on text neck syndrome in children and adolescents. This study proved that new phenomena of text neck syndrome the underline causes and risk factors of Musculo skeletal pain that can be modified by changes in routine life of young adults.

International Journal Of Environmental Research And Public Health 2021.

Priyal P.shah et al, 2018; has done a study on correlation of smart phone use edition with text neck syndrome and SMS thumb in physiotherapy students. Text neck syndrome and SMS thumb may occur due to repetitive use of hand-held devices resulting in repetitive stress injury or an over use syndrome while using their mobile phones or other electronic devices for prolonged periods of time. The study examined 100

healthy physiotherapy students of a college in Ahmedabad by random table sampling with outcomes of neck disability index, Cornell hand discomfort questionnaire was taken. The study concluded that musculoskeletal problems in neck and hand can be seen in smart phone addicted students which maybe short term initially but maybe later and to long-term disability.

International journal of community medicine and public health, vol 5, issue 6, June 2018.

Luciana De Arouja Cazotti, et, al, 2018;

To assess the effectiveness of pilates method on pain, function, quality of life, and consumption of pain medication in patients with mechanical neck pain. The design was randomized controlled trail, with a blinded assessor and intension to treat analysis. The protocol included pilates exercise performed on a mat and on equipment and was adapted depending on the physical fitness of each participant. The CG received only the standard pharmacological treatment. Both groups were instructed to use acetaminophen. This trail demonstrated the effectiveness of pilates method for the treatment of chronic mechanical neck pain, resulting in improvement of pain, function, quality of life, and reduction of the use of analgesics.

Archives Of Physical Medicine And Rehabilitation Vol 99, issue 9, 2018

Cemin NF, Schmit EF 2017 et al, The Pilates method has been used for neck pain reduction To systematically review randomized and non-randomized controlled trials that assessed the effects of Pilates on neck pain when compared to other groups. This study involved a systematic review directed by the PRISMA Statement based on the recommendations of the Cochrane Collaboration, registered in PROSPERO under the code CRD42015025987. The following databases were searched: Cochrane CENTRAL, EMBASE, PubMed, Science Direct, Scopus and Web of Science, using the terms "Pilates" AND "Neck pain",

without language and date restrictions. Of a total of 73 identified studies, two were included herein since they fulfilled the eligibility criteria (at least one intervention group applying Pilates), where we evaluated the methodological quality by the Downs and Black scale and evidence strength with the Best Evidence Synthesis. Pain and disability decreased from the sixth session, with gradual improvement in up to 24 sessions. Few studies are available using Pilates to decrease pain, and moderate evidence exists of positive Pilates effects on pain and function in patients with neck pain.

Scientific Electronic Library 2017.

Sunil Neupane, U Ali, A Mathew et,al, 2017;

A recent study shows that 79% of the population between the age 18- 44 have their cell phones with them almost all the time, with only 2 hour of their walking day spend without their cell oh hand a structured literature search was done using various electronic and print data bases. PubMed, APTA, Science Direct, total 45 studies were shortlisted from which 10 of them with proper methodology were reviewed and reported. Studies include both survey, cross sectional randomised control trails. In this review smart phone induced neck pain and associated problems are of chronic progressive nature, timely interpretation and interventions along with good knowledge about postural correction will be the key entities to deal with Text Neck Syndrome. Further clinical trials recommending the effectiveness of current practice will be great use in designing an evidence based protocol.

Imperial Journal Of Interdisciplinary Research Vol 3, 2017.

Sun- Myung Lee, Ms, Md, David O' Sullivan, PhD, et, al, 2016; has done a study on clinical effectiveness of Pilates treatment for forward head posture, this study compared the effects of Pilates and an exercise program on the craniovertebral angle, cervical range of motion, pain, and muscle fatigue in subjects with forward

head posture. A total of 28 sedentary females with FHP are randomly assigned to Pilates and combined exercise groups. The study was randomized, controlled, double-blind study with the two groups performing exercise 50 min /day, 3 days/week, with an intensity of 11-15 rating of perceived exertion for ten weeks. The main outcome measures were craniovertebral angle, cervical range of motion, pain levels assessed by Visual Analog Scale and Neck Disability Index. Surface electromyography was also used to measure muscle fatigue. There was significant increase in craniovertebral angle and cervical ROM in the Pilates group, but none in the control group. The only significant differences in muscle activity were recorded in the sternocleidomastoid muscle in the Pilates group. Both exercise programs had positive effects on pain measures, as VAS and NDI were significantly decreased. The results suggested that Pilates could be recommended as an appropriate exercise for the treatment of forward head posture in sedentary individuals.

The Journal Of Physical Therapy Science, Vol.28, No.7, 2016.

Germaine Mallin B, Susan Murphy et al, 2013; Neck pain is becoming increasingly more common and multiple interventions have been advocated in its management. Pilates is one form of exercise that is developing in popularity. This pilot uncontrolled study investigates whether a 6-week matwork based Pilates programme can change outcome measures in a group of chronic neck pain patients. Thirteen subjects were assessed on self-report tests; neck disability index (NDI), patient specific functional scale (PSFS), numerical rating pain scale (NRPS) and one objective measure; the abdominal drawing in test (ADIT). A statistically significant improvement was obtained in the disability outcomes (NDI and PSFS) at both 6 and 12 weeks. The NRPS also demonstrated statistical improvement at 12 weeks but not at 6. The minimal clinically important

difference (MCID) is the score that reflects a change that is meaningful for the patient and this was achieved at 12-weeks for the NDI (>5 points), PSFS (>3 points) and NRPS (>2 points). Only 2 subjects reached normal levels in the ADIT at 12-weeks. The results of this pilot study suggest that Pilates has a role to play in reducing pain and disability in neck pain patients.

Journal Of Bodywork And Movement Therapies 2013.

Wontae Gong, PhD, PT, et, al 2011; has done a study on the effects of Gong's Mobilization on cervical lordosis forward head posture and cervical range of motion in abnormal posture of cervical spine of college students. In this study the effectiveness of Gong's Mobilization and sustained natural apophyseal glides (SNAGS) were compared in college students who had problems with cervical lordosis, forward head posture (FHP), and cervical ROM. Forty college students in their twenties with problems of cervical posture and ROM were divided in to a Gong's mobilization group (n=20) and a SNAGS group (n=20). Gong's Mobilization and SNAGS were administered three times a week for four weeks to each respective group and then changes in cervical lordosis, FHP and cervical ROM were evaluated. Gong's Mobilization was effective at increasing cervical lordosis, cervical extension ROM (CER), and ranges of flexion and extension motion (RFEM), as well as decreasing FHP. In contrast, SNAGS was effective at increasing CER and decreasing FHP. Although both Gong's Mobilization and SNAGS affected cervical posture and ROM, Gong's mobilization was more effective in increasing cervical lordosis cervical extension and ranges [CER] of flexion and extension motion [RFEM].

Journal Of Physical Therapy And Sciences, Volume. 23, No.3, 2011.

MATERIALS AND METHODS

STUDY DESIGN: QUASI EXPERIMENTAL STUDY.

ETHICAL CLEARANCE: The study protocol was approved by the Ethical committee of GSL Medical College and General Hospital (Annexure-1), the investigator explained the purpose of the study and given the patient information sheet. The participants were requested to provide their consent to participate in the study (Annexure- 11). All the participants signed the informed consent and the rights of the included participants have been secured.

STUDY POPULATION: Students of GSL Medical College.

STUDY SETTING: The study was conducted at department of Physiotherapy, GSL General Hospital, Rajamahendravaram, Andhra Pradesh, India.

STUDY DURATION: The study was conducted during the period of one year.

INTERVENTION DURATION: 5 sessions per week for 6 weeks.

STUDY SAMPLING METHOD: Convenience sampling.

SAMPLE SIZE: A total number of 60 subjects, both men and women with text neck syndrome who are willing to participate in the study were included in this study, all the recruited participants were explained about the study. After obtaining informed consent form and meeting the criteria, total 60 subjects were allocated in to two groups equally by Convenience sampling method.

GROUP A: Pilates (30 subjects).

GROUP B: Gong's Mobilization (30 subjects).

GROUPS	NO. OF STUDENTS	TREATMENT
GROUP A	30	PILATES EXERCISES
GROUP B	30	GONG'S MOBILIZATION

MATERIALS USED

Physiotherapy mat, Pillows, VAS scale, Neck Disability Index, Universal Goniometer.

INCLUSION CRITERIA:

- Both males and females are taken.
- Age group between 18-45 years.
- More than one year of using any electronic gadgets.
- Using smart phone more than 4 hours/day.
- Craniovertebral Angle < 53.

EXCLUSION CRITERIA:

- Trauma.
- Patients undergone cervical surgery.
- Torticollis.
- Pregnancy.
- Psychological problems.

STUDY TOOLS AND OUTCOME MEASURES

1. Visual Analogue Scale (VAS) was used to measure Pain at base line and at the end of the 6th week.
2. Universal Goniometer is used to measure the Range of Motion in neck flexion and extension at base line and at the end of the 6th week.
3. Neck Disability Index is used to measure the function at base line and at the end of the 6th week.

INTERVENTION

This study consists of 6 weeks of intervention which includes Pilates Exercises for Group A and Gong's Mobilization for Group B. The outcomes were measured by using Visual Analogue Scale, Universal Goniometer and Neck Disability Index. The participants are randomized in to Group A and Group B. The treatment protocol consists of 5 sessions of Pilates treatment programme per week and 5 sessions of Gong's Mobilization per 6 weeks.

Group A (PILATES EXERCISES) ²³:

The participants of Group A were treated with Pilates Exercise. It is a 6 weeks protocol which consists of different exercises. No of exercises increases according to the weeks.

- 1. HIP TWIST LEVEL 1:** The subject was positioned in supine lying with knees flexed and the right knee moves away from and then towards midline while maintaining a neutral spine position.



Fig no.1 HIPTWIST LEVEL-1

- 2. ONE LEG STRETCH LEVEL 1:** The subject was in supine lying with left knee folded in to the chest and ask the subject to extend the left leg without allowing the pelvis to anterior tilt.



Fig no. 2 ONE LEG STRETCH LEVEL 1

- 3. DOUBLE LEG STRETCH LEVEL 1:** The subject was in supine lying with both legs folded and arms are lowered overhead as far as control of the ribcage and pelvis can be maintained.



Fig no.3 DOUBLE LEG STRETCH LEVEL 1

- 4. DOUBLE LEG STRETCH LEVEL 2:** As for level 1 but simultaneously sliding the both heel along the mat away from the body and both arms stretched away from each other.



Fig no. 4 DOUBLE LEG STRETCH LEVEL 2

- 5. CLAM LEVEL 1:** The subject was in side lying, hips and knees are flexed to 90⁰ their bottom arm is stretched out and rest their head on it. Keeping the toes together move the knee away from the other.



Fig no. 5 CLAM LEVEL 1

- 6. SHOULDER BRIDGE LEVEL 1:** The subject was in supine lying, with their knees bent and hip width apart and arms should on their side with palms down. And lift the pelvis and hip creating a diagonal line from knee to shoulder



Fig no. 6 SHOULDER BRIDGING LEVEL 1

- 7. ARM OPENINGS LEVEL-1:** The subject was inside lying with hip and knee flexed, shoulders are stretched right angled to the neck and uppermost arm is lifted away from the body to open the upper chest and rotate the thoracic and lumbar spine.



Fig no.7 ARM OPENINGS LEVEL 1

- 8. SCISSORS LEVEL – 1:** The subject was in supine lying the left knee is lifted over the hip 90° angle at knee and hip while keeping the pelvis in neutral position.



Fig no. 8 SCISSORS LEVEL 1

- 9. BREAST STROKE PREP LEVEL 1:** The subject was lying on the chest with head resting on the folded towel shoulder blades glide downward away from the ears while lifting the arms 4-5 cm off the mat.



Fig no. 9 BREAST STROKE PREP LEVEL 1

- 10. BREAST STROKE PREP LEVEL 2:** As for level 1 with the upper body lengthened off the mat to hover the breast bone 3cm from the floor while maintaining a neutral lumbo- pelvic position.



Fig no. 10 BREAST STROKE PREP LEVEL 2

These exercises were given to the subjects according to the week protocol for about 5 sessions a week for 6 weeks. Each exercise was given for 5 repetitions.

WEEKLY PROTOCOL

Week 1	Week 2	Week 3	Week 4	Week 5	Week 6
1.Hiptwist level 1[5 reps]	1.Hiptwist level 1[5reps]	1.Hiptwist level 1[5reps]	1.Hiptwist level 1[5reps]	1.Hiptwist level 1[5reps]	1.Hiptwist level 1[5reps]
2.One leg stretch level1 [5reps]	2.One leg stretch level1 [5reps]	2.One leg stretch level1 [5reps]	2.One leg stretch level1 [5reps]	2.One leg stretch level1 [5reps]	2.One leg stretch level1 [5reps]
3.Double leg stretch level1 [5reps]	3.Double leg stretch level1 [5reps]	3.Double leg stretch level1 [5reps]	3.Double leg stretch level1 [5reps]	3.Double leg stretch level1 [5reps]	3.Double leg stretch level1 [5reps]
NILL	4.Double leg stretch level2 [5 reps]	4.Double leg stretch level2 [5 reps]	4.Double leg stretch level2 [5 reps]	4.Double leg stretch level2 [5 reps]	4.Double leg stretch level2 [5 reps]
NILL	5.Clam level1[5 reps]	5.Clam level1[5 reps]	5.Clam level1[5 reps]	5.Clam level1[5 reps]	5.Clam level1[5 reps]
NILL	NILL	6.Shoulder bridge level 1[5 reps]	6.Shoulder bridge level 1[5 reps]	6.Shoulder bridge level 1[5 reps]	6.Shoulder bridge level 1[5 reps]
NILL	NILL	NILL	7.Arm openings level 1 [5 reps]	7.Arm openings level 1 [5 reps]	7.Arm openings level 1 [5 reps]
NILL	NILL	NILL	NILL	8.scissors level1 [5reps]	8.scissors level1 [5reps]
NILL	NILL	NILL	NILL	NILL	9.Breast stroke prep level1[5reps]
NILL	NILL	NILL	NILL	NILL	10.Breast stroke prep level2[5reps]

Group-B (GONG'S MOBILIZATION)²⁵:

The subject sat on the stool with the therapist standing side to the patient, the position of the stool is maintained in certain position until the subjects check came in contact with the therapist chest then the therapist wrapped one arm around the other cheek of the patient neck. If the cervical vertebrae C4 and C5, were fixed, the therapist places the thumb in contact with C5 spinous process, which is below the fixed joint. This is the starting posture then the hand in contact with the spinous process then gently pushed the process along the joint facet, while the hand that wrapped around the cheek restricted the movements

of the joint facets ranging from C4 to the occipital bone, using the palm, while pushing the cheeks on both sides backward in order to induce cervical retraction. As the end range of the cervical retraction approached, passive extension was done while maintain the pressure applied to the process. Here the speed of extension was increased, using gravity and the head weight, as the extension approached its end range. This is applied from the joints on the lower side of the cervical spine to the joints on the upper side of the cervical spine. The treatment procedure was performed for 5 sessions for 6 weeks.



Fig no. 13 THERAPIST PERFORMING GONG'S MOBILIZATION

STATISTICAL ANALYSIS

All statistical analysis was done by using SPSS software version 21.0 and Micro soft excel- 2007. Descriptive data was presented in the form of mean +/- standard deviation and mean difference percentages were calculated and presented.

Within the groups: Paired student “t” test was performed to assess the statistical difference within the groups for Pain, Cervical Range Of Motion and Function from Pre-test and Post-test values.

Between the groups: Independent student “t” test was performed to assess the statistically significant difference in mean value between the groups for Visual Analogue Scale for Pain, Universal Goniometer for Cervical Range of Motion, Neck Disability Index for function. For all statistical analysis, $p < 0.05$ was considered as statistically significant.

RESULTS

The results of this study were analyzed in terms of Pain relief, increased Cervical Flexion and Extension Range of Motion on Universal Goniometer, improved Function on Neck Disability Index. The consort flow chart of the study showed the study organization terms of subjects screening, random allocation and analysis following the intervention.

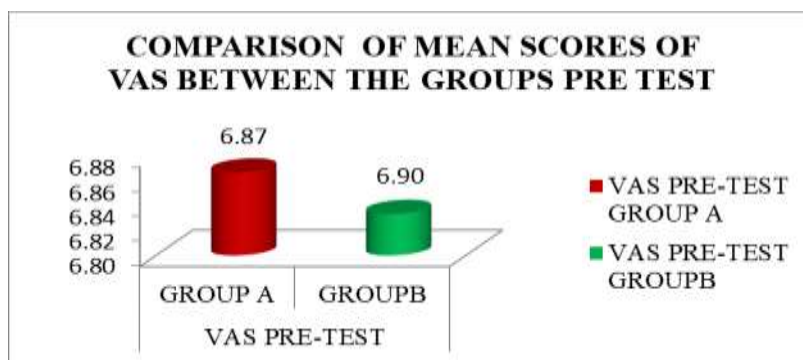
A total of 60 subjects were screened for eligibility and are included in the study. All the subjects who met the inclusion criteria have undergone baseline assessment and included subjects were randomized in to two equal groups consisting of 30 subjects each. In this study 30 participants completed training in Group-A and 30 participants completed training in Group-B.

Comparison was done both within the Groups as well as in between the two Groups. So as to evaluate the intra Group and inter Group effectiveness of Pilates and Gong's Mobilization techniques which are under consideration in the present day.

COMPARISON OF MEAN SCORES OF VAS IN BETWEEN THE GROUPS

GROUPS		Mean	Std. Deviation	P VALUE	INFERENCE
VAS PRE-TEST	GROUPA	6.87	1.09	0.7868	Insignificant
	GROUPB	6.90	.088		

TABLE – 1



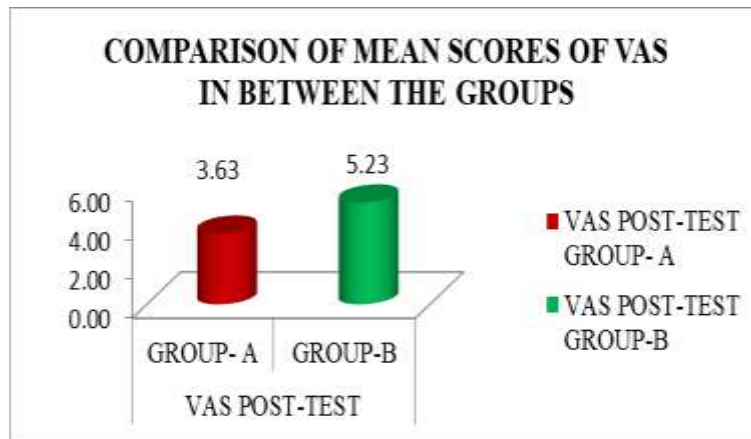
GRAPH – 1

RESULTS: The above table and graph shows the Pre-Test measurement of VAS Mean Score in between the Groups. VAS Mean Score in GROUP A and GROUP B were found to be Statistically Insignificant

COMPARISON OF MEAN SCORES OF VAS IN BETWEEN THE GROUPS POST TEST

GROUPS		MEAN	SD	P VALUE	INFERENCE
VAS POST-TEST	GROUP- A	3.63	0.72	0.0001	SIGNIFICANT
	GROUP- B	5.23	0.97		

TABLE-2



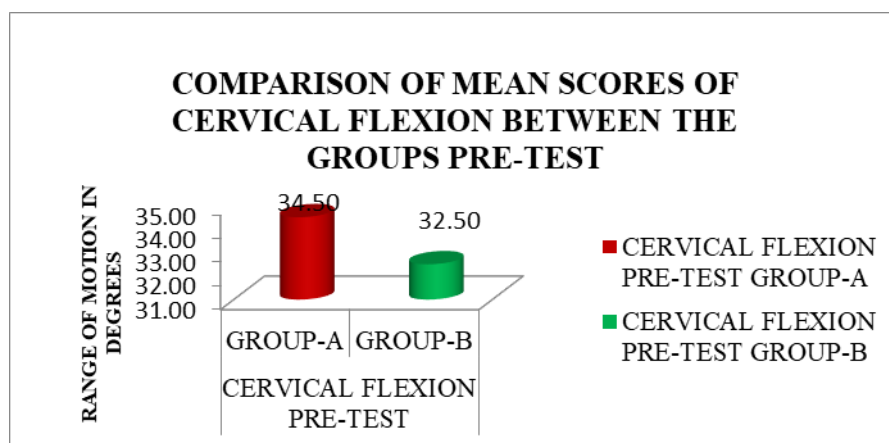
GRAPH-2

RESULTS: The above table and graph shows the Mean Scores of VAS changes between the Group A Post-Test and Group B Post-Test were found to be Statistically Significant ($p < 0.05$).

COMPARISON OF MEAN SCORES OF CERVICAL FLEXION BETWEEN THE GROUPS PRE-TEST

GROUPS		Mean	Std. Deviation	P value	Inference
CERVICAL FLEXION PRE- TEST	GROUP A	34.50	7.583	0.235	INSIGNIFICANT
	GROUP B	32.50	5.043		

TABLE-3



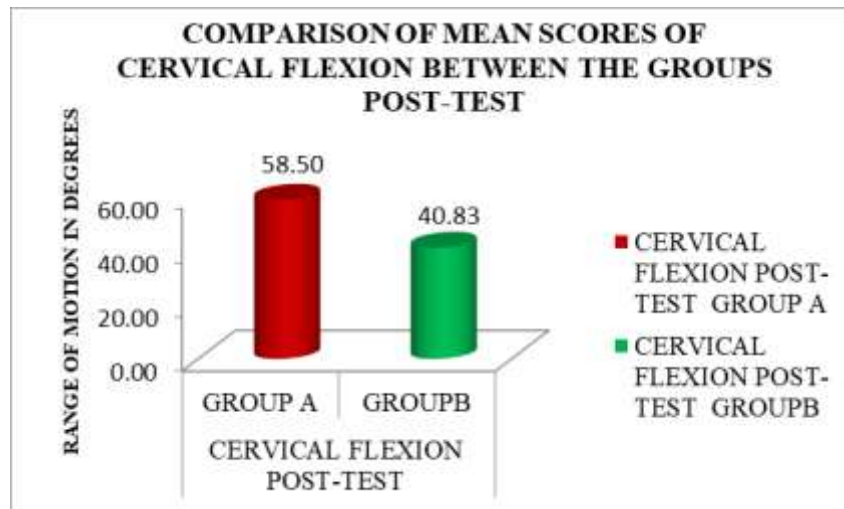
GRAPH -3

RESULTS: The above table and graph shows the Pre-Test measurements of Cervical Flexion between the Groups. Cervical Flexion Mean Score in Group A and Group B were found to be statistically Insignificant.

COMPARISON OF MEAN SCORES OF CERVICAL FLEXION BETWEEN THE GROUPS POST-TEST

GROUPS		Mean	Std. Deviation	P value	Inference
CERVICAL FLEXION POST TEST	GROUP A	58.50	6.967	0.001	SIGNIFICANT
	GROUP B	40.83	6.444		

TABLE-4



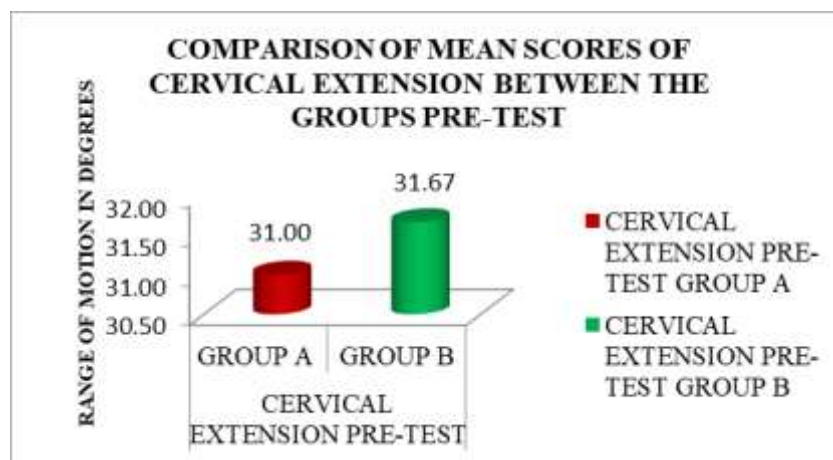
GRAPH-4

RESULTS: The above table and graph shows the Post-Test measurements of Cervical Flexion between the Groups. Cervical Flexion Mean Score in Group A and Group B were found to be statistically Significant

COMPARISON OF MEAN SCORES OF CERVICAL EXTENSION BETWEEN THE GROUPS PRE-TEST

GROUPS		Mean	Std. Deviation	P value	Inference
CERVICAL EXTENSION PRE-TEST	GROUP A	31.00	7.589	0.725	INSIGNIFICANT
	GROUP B	31.67	6.989		

TABLE- 5



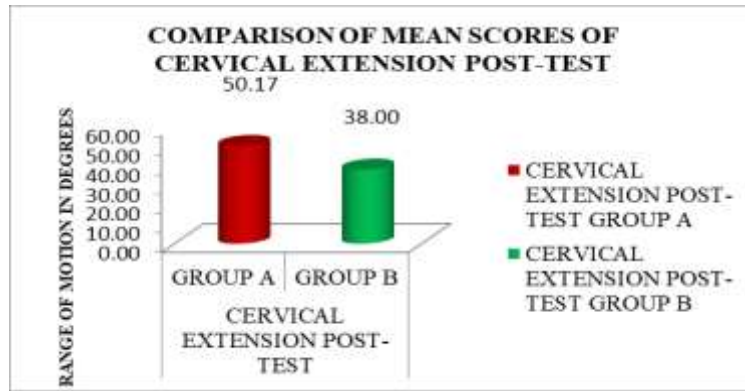
GRAPH 5

RESULTS: The above table and graph shows the Pre-Test measurements of Cervical Extension between the Groups. Cervical Extension Mean Score in Group A and Group B were found to be statistically Insignificant.

COMPARISON OF MEAN SCORES OF CERVICAL EXTENSION BETWEEN THE GROUPS POST-TEST

GROUPS		Mean	Std. Deviation	P value	Inference
CERVICAL EXTENSION POST TEST	GROUP A	50.17	6.757	0.001	SIGNIFICANT
	GROUP B	38.00	5.186		

TABLE- 6



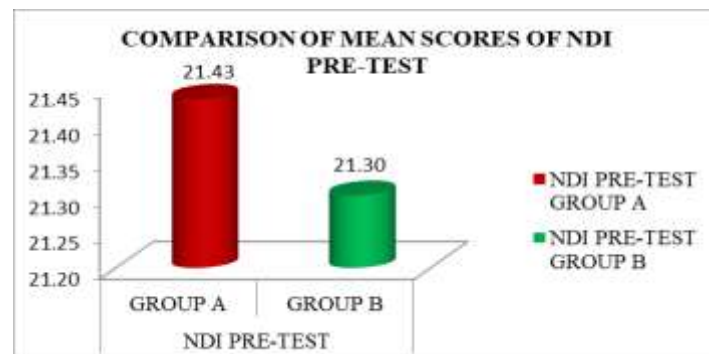
GRAPH-6

RESULTS: The above table and graph shows the Pre-Test measurements of Cervical Extension between the Groups. Cervical Extension Mean Score in Group A and Group B were found to be statistically Significant.

COMPARISON OF MEAN OF NDI IN BETWEEN GROUPS PRETEST

GROUPS		Mean	Std. Deviation	P value	Inference
NDI PRE-TEST	GROUP- A	21.43	5.425		
	GROUP-B	21.30	4.714		

TABLE-7



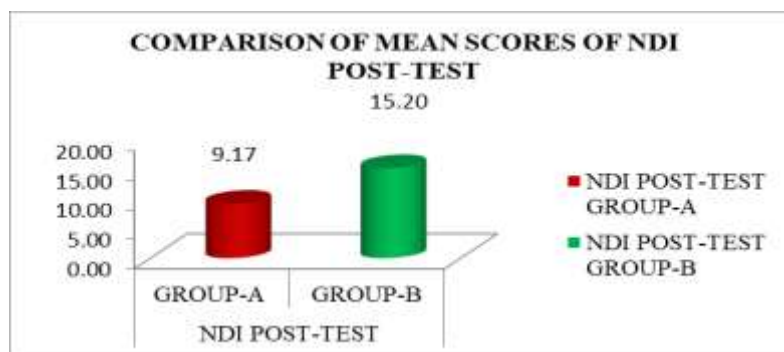
GRAPH-7

RESULTS: The above table and graph shows the Pre-Test measurement of NDI Mean Score in between the Groups. NDI Mean Score in GROUP A and GROUP B were found to be statistically Insignificant.

COMPARISON OF MEAN OF NDI IN BETWEEN GROUPS POSTTEST

GROUPS		Mean	Std. Deviation	P value	Inference
NDI POST-TEST	GROUP A	9.17	3.052		
	GROUP B	15.20	4.197		

TABLE-8



GRAPH-8

RESULTS: The above table and graph shows the Post-Test measurement of NDI Mean Score in between the Groups. NDI Mean Score in GROUP A and GROUP B is were found to be statistically Significant.

DISCUSSION

The Aim of the study was to evaluate the effectiveness of Pilates and Gong's Mobilization on Pain, Range of Motion and Function in subjects with Text Neck Syndrome. In this study, subjects were assessed for Pain using VAS, Range of Motion by Universal Goniometer and function by NDI (Neck Disability Index) respectively.

In this study young adults were taken, a study reported that 79% of the population in the age group 18-24 years have a smart phone with them most of the time (Nepane et al. 2017). 82% of the Swedish population aged between 15 to 24 years had a smart phone and frequently used their phone for short messages (Skierkowski and Wood 2012).

A study reported that 35% of smart phone users had Text Neck Syndrome (Samani et al. 2018). Alzaid et al. (2018) reported that the population in the age group 15- 18 years is prone to developing neck pain. There is also prevalence of neck pain in around 70% of children in the age group 7-11 years i.e., those who are spending around 5- 8hrs per day using electronic devices.

Several studies have investigated the impact of smartphone addiction on musculoskeletal system. A1Abdulwahab et al. found a strong association between smartphone addiction and neck problems (A1Abdulwahab et al. 2017). Several studies have reported a significant increase in the number of adolescent smartphone users and its association with the musculoskeletal discomfort (Ming et al.2006; Berolo et al. 2011; Sharan et al 2014) in recent years, which is becoming a growing problem and has a large impact globally.

Previous studies have addressed the effects of different exercises and modalities on Text Neck Syndrome or Forward Head Posture including scapular stabilization exercises, Kendall stretching (Sheikh Hoseini R et al.2019) and strengthening exercises (Sheikh Hoseini R, Shahrbanian et al.2018).

Pilates is described by a unique technique of physical fitness that uses a combination of

muscle lengthening and strengthening along with breath control in order to develop core muscles and restore muscle balance. Pilates encourages a neutral cervical spine position with slight upper cervical flexion at cranio-cervical junction leading to activation of the deep neck flexor muscles (segal and Hein 2004; Herrington and Davies, 2005; kuo et.al.2009). Pilates works by combining breathing techniques with special stretches.

A study showed that spinal stabilization exercises like Pilates benefits to manage back and neck pain (Moffett and Mc Lean, 2006). Neck pain is mainly associated with inefficiency in deep cervical flexor muscles. Thus, reeducating the stabilizing muscles of the spine and shoulder girdle, with the help of Pilates have beneficial effects to manage back pain and restore function.

This study was supported by jill shah, et.al, that Pilates helps by encouraging activation of deep neck flexor muscles with a neutral position of the cervical spine. This helps to build strength and endurance of the cervical muscles and thus reducing pain and disability.

Pilates pays special attention to the muscles which stabilize joints. Thus, encouraging correct body mechanics. Therefore, strengthens the deep spinal stabilizing muscles, lengthens the spine, trains mind and body awareness and improve posture (herman, 2004). Hence Pilates helps in reduction of Pain and increase of Range of Motion which results in increase of functional abilities.

Recently a study done on Korean population has shown the effectiveness of Gong's Mobilization on postural deviations such as Forward Head Posture, Cervical Lordosis and decreased cervical range of motion as compared to sustained natural apophyseal glide techniques McNair et al. applied SNAGS to patients with acute neck pain in upright sitting position and reported a considerable decrease in pain, less difficulty in movements and reduce stiffness. While in SNAGS technique requires that patients perform active cervical extensions in neutral postures, most patients have forward neck

which makes it difficult for normal cervical ROM. It is difficult to control movements in segments other than fixed segments, Gong's Mobilization which compensates the disadvantages of the SNAGS technique by using gravity, weight, and acceleration while limiting the movement of other joints to improve the mobility of one joint. Subhash M. Khatri et al proved in gongs mobilization, the movements of joint facets, other than the fixed joint that was moved through passive movements, were well restricted and thus the mobility of the fixed joint greatly increased.

In this study subjects were assessed for TEXT NECK SYNDROME underwent either Pilates exercises or Gong's Mobilization which are performed for six weeks, The parameters were assessed before and after 6 weeks exercise training.

The results showed significant improvement in outcome measures, VAS, Universal Goniometer and NDI in both the techniques after 6 weeks of intervention. The two techniques were similarly effective in decreasing Pain, improving Range of Motion and Function in subjects with the Text Neck Syndrome.

Both the Pilates exercise group and Gong's Mobilization group showed statistically significant differences, but the Pilates exercise group shown superior statistically significant difference.

LIMITATIONS

- Small sample size.
- Only limited age group are included in the study.
- Lack of control group.
- No blinding of evaluators.
- Lack of follow-up in the present study.

RECOMMENDATIONS FOR FURTHER RESEARCH

- The length of the study can be extended by either 8 or 12 weeks.
- Sample size can be increased in greater number of subjects to generalize the effects of these techniques in larger population.

CONCLUSION

In conclusion, six weeks interventions of both the Pilates and Gong's Mobilization Group have shown significant improvement in reducing Pain, Improving Range Of Motion and Function in Teck Neck Syndrome among young adults. However, Pilates Group has shown better improvement when compared to Gong's Mobilization Group.

Declaration by Authors

Ethical Approval: Approved

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