

Effectiveness of Pilates along with Conventional Exercise Program and Conventional Exercise Program Alone in Subjects with Text Neck Syndrome

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Abstract: Text Neck Syndrome is a commonly found condition in students as they hang their head downwards for a long period of time while using mobile phones. This leads to pain, disability, and reduction in strength and endurance of the cervical muscles. 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 benefit of patients. So a Quasi-Experimental study was conducted in which 30 participants with features of text neck syndrome were studied for 6-week intervention. They were divided into 2 groups by convenience sampling: - Group A: conventional exercise program and Group B: Pilates along with conventional exercise program. Pre and post-treatment data were collected and analyzed using SPSS 26.0. Paired and unpaired t-test was used to find out the significance of the treatment. A significant improvement in pain, disability, muscle strength, and endurance ($p < 0.05$) after the treatment was found in both groups. Greater statistical 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.

Keywords: Text Neck Syndrome, Deep Cervical Flexors, Pain, Cervical Muscle Strength and Endurance, Pilates

1. Introduction

In the current scenario, COVID-19 pandemic caused by the novel corona virus (SARS-CoV-2) has created an unpredictable challenge across the globe. The virus spreads by local contact between the people, so to reduce the risk of transmission various national governments have introduced extensive 'lockdown' measures. Control strategies rely on reducing contact between people through social distancing, restrictions on social gatherings, closures of educational institutions and offices, stay-at-home orders, travel restrictions, etc. Due to this smart phone technology has influenced many areas such as business, health, social life, education and further more as closure of schools, colleges offices has led to people work and study from home. Students are attending online classes conducted by colleges, studying using mobile phones; also the use of smart phones for entertainment purposes is increased during this lockdown period.

Gold et al reported that over 90% of students adopted a flexed neck posture with shoulders protracted and non-neutral position of wrist while using their mobile phones. A person has his/her head hung down in flexed position while looking at their mobiles or other electronic devices for prolonged periods of time.

The combination of repetitive movements, poor posture, and over-use of phones for texting and playing games, studying without taking breaks, can cause injury to the nerves, muscles, and tendons in the fingers, hands, wrists, arms,

elbows, shoulders, and neck too which if ignored, may lead to further problems.^{[1], [2]}

The term "Text Neck" was coined by Dr. Dean L. Fishman, a US Chiropractor describing the neck pain and damage to neck muscles caused due to stress injury or overuse syndrome due to repetitive and sustained looking down at the cell phones in bad posture.

A person suffering from Text Neck Syndrome most commonly experiences neck pain, upper back pain and soreness. Gradually it may lead to chronic, sharp, nagging pain along with severe upper back muscle spasm.^{[3], [4]} Due to this abnormal posture the cervical muscles mainly deep cervical flexors weaken due to increased strain on muscle, this is the main reason of pain in Text Neck Syndrome. Thus reduction in the strength and endurance of cervical muscles, postural changes are seen in individuals with Text Neck Syndrome. If text neck is ignored and left untreated at time, then it can lead to serious permanent damage, such as: flattening of the spinal curvature, early onset of arthritis, spinal misalignment, spinal degeneration, disc compression, disc herniation, nerve or muscle damage, inflammation of cervical ligaments, nerve irritation, increase in curvature of spine, etc.^{[4], [5], [6]}

Exercise forms one of the most important component of the rehabilitation of neck pain. Exercises includes low load endurance training, scapular muscle re-training, strengthening and stretching exercises, joint mobilization, massage, ergonomical advice according to the physiotherapist and patient's condition.^{[7], [8], [9], [10]}

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Pilates is a form of exercise that has become more widely used in recent years in both fitness and rehabilitation sectors. Pilates method is a type of physical and mental conditioning training using well designed and choreographed movements and is based on the teachings of Joseph Pilates (1880 to 1967). It pays special attention to the muscles that stabilizes the joints, thus encouraging correct body mechanics (Bass, 2005).^[11] It therefore strengthens the deep spinal stabilizing muscles, lengthens the spine, trains mind-body awareness and improves fitness, flexibility, core strength, posture, balance a (Herman, 2004).^{[11], [12]} A study showed that spinal stabilization exercises, such as Pilates are beneficial in managing back pain (Moffett & McLean, 2006). Modern Pilates combines the ancient principles of Pilates along with FITT (fitness, intensity, time and type) principles for general exercises.^{[13], [14]}

The effectiveness of Pilates intervention for the Text Neck Syndrome is very limited. So, the need of the study is to find the effectiveness of Pilates versus Conventional Exercise Program in students with text neck and determine the better of these to get best results & greater benefits for the population.

2. Methodology

A self-administered questionnaire was prepared in Google Form that was to be circulated among people via e-mail and WhatsApp. The questionnaire included the following questions: 1) Personal information and information related to their phone usage, 2) Characteristics of the pain and 3) What does the individual do during pain. After Institutional Ethical approval, the Google form was circulated.

Participants of both gender whose age was between 18 to 24 years of age, having symptoms of text neck syndrome, using smart phones for more than 4 hours/day and who were willing to be a part of the study were included in the study.^[16, 3] These individuals were informed about the study and the procedure was clearly explained to all. An informed and written consent was obtained from the subjects those who agreed to be a part of the study that was to be conducted. Individuals with any neurological defect, any recent shoulder and neck or arm injury or with any history of cervical or head trauma or surgical intervention in the neck area were not included in the study. Also individuals with severe neck pain which required medical treatment or with any cervical disc disease like radiculopathy or inflammatory or malignant type of pain or suffering with any systematic diseases were not selected.

The participants which were selected were then randomly assigned by lottery method in to 2 groups A and B. Thirty subjects with mean age of 21.1 ± 0.84 (mean ± SD) became a part of the study. The participants underwent a detailed pre-evaluation. The pre-evaluation included an Orthopedic assessment which obtained information about demographic details, medical history, personal history, pain assessment, functional scale, muscle strength and endurance of the subjects. Pain was assessed by Numerical Pain Rating Scale (NPRS), functional disability was scored by Neck Disability Index (NDI) and Muscle Endurance and Strength by Pressure Biofeedback Unit (Chattanooga).

The participants of Group A were treated with conventional exercise program and Group B were treated with Pilates exercise along with the conventional exercise program. Along with this all the participants were given ergonomical and home advice. The treatment protocol consisted of 5 sessions of conventional treatment program/ week, and 5 sessions of Pilates treatment for 6 weeks. After 6 weeks of treatment the participants of both groups underwent post-evaluation and the pre and post- treatment data were noted and then evaluated further.

Table No. 1: Exercise Protocol for Group A

WEEK 1	WEEK 2	WEEK 3	WEEK 4	WEEK 5	WEEK 6
1.Stretching : [15 seconds hold for 3 repetitions]	1.Stretching: [15 seconds hold for 3 repetitions]	1.Stretching: [15 seconds hold for 3 repetitions]	1.Stretching: [15 seconds hold for 3 repetitions]	1.Stretching: [15 seconds hold for 3 repetitions]	1.Stretching: [15 seconds hold for 3 repetitions]
2.Active range of motion exercise: [3 repetitions each]	2.Active range of motion exercise: [3 repetitions each]	2.Active range of motion exercise: [3 repetitions each]	2.Active range of motion exercise: [3 repetitions each]	2.Cervical isometrics : [3-5 repetitions each]	2.Cervical isometrics : [3-5 repetitions each]
		3.Cervical Isometrics: [3-5 repetitions each]	3.Cervical Isometrics: [3-5 repetitions each]	3.Lateral bending with chin tucked in [5 repetitions each]	3.Lateral bending with chin tucked in [5 repetitions each]
		4.Chin tuck-in : [5 repetitions with 10 seconds hold]	4.Chin tuck-in : [5 repetitions with 10 seconds hold]	4.Neck curl with chin tucked in [5 repetitions each]	4.Neck curl with chin tucked in [5 repetitions each]

Table No. 2: Exercise Protocol for Group B

WEEK 1	WEEK 2	WEEK 3	WEEK 4	WEEK 5	WEEK 6
1.Hip twist level 1 [5 reps]	1.Hip twist level 1 [5 reps]	1.Hip twist level 1 [3 reps]	1.Hip twist level 1 [3 reps]	1.Hip twist level 1 [3 reps]	1.Hip twist level 1 [3 reps]
2.One leg stretch level 1 [5 reps]	2.One leg stretch level 1 [5 reps]	2.One leg stretch level 1 [3 reps]	2.One leg stretch level 1 [3reps]	2.One leg stretch level 1 [3reps]	2.One leg stretch level 1 [3reps]
3.Double leg stretch level 1 [5 reps]	3.Double leg stretch level 1 [5 reps]	3.Double leg stretch level 1 [5 reps]	3.Double leg stretch level 1 [3 reps]	3.Double leg stretch level 1 [3 reps]	3.Double leg stretch level 1 [3 reps]
	4.Double leg stretch level 2 [5 reps]	4.Double leg stretch level 2 [5 reps]	4.Double leg stretch level 2 [5 reps]	4.Double leg stretch level 2 [5 reps]	4.Double leg stretch level 2 [5 reps]
	5.Clam level 1 [5 reps]	5.Clam level 1 [3 reps]	5.Clam level 1 [3 reps]	5.Clam level 1 [3 reps]	5.Clam level 1 [3 reps]
		6.Shoulder bridge level 1 [5 reps]	6.Shoulder bridge level 1 [5reps]	6.Shoulder bridge level 1 [5reps]	6.Shoulder bridge level 1 [5reps]
			7.Arm openings level 1 [3reps]	7.Arm openings level 1 [3reps]	7.Arm openings level 1 [3reps]
				8.Scissors level 1 [5 reps]	8.Scissors level 1 [5 reps]
					9.Breaststroke prep level 1 [3reps]
					10.Breaststroke prep level 2 [5reps]



Photograph No. 1: Measurement of Cervical Muscle Strength and Endurance by Pressure Biofeedback Unit



Photograph No.2: Hip Twist Level 1



Photograph No.3: One leg stretch Level 1



Photograph No.4: Double leg stretch Level 1



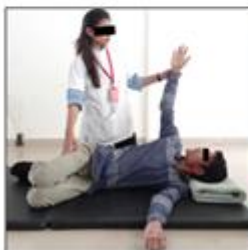
Photograph No.5: Double leg stretch Level 2



Photograph No.6: Clam Level 1



Photograph No.7: Shoulder bridge Level 1



Photograph No.8: Arm Opening Level 1



Photograph No.9: Scissors Level 1



Photograph No.10: Breaststroke prep Level 1



Photograph No.11: Breaststroke prep Level 2

3. Result

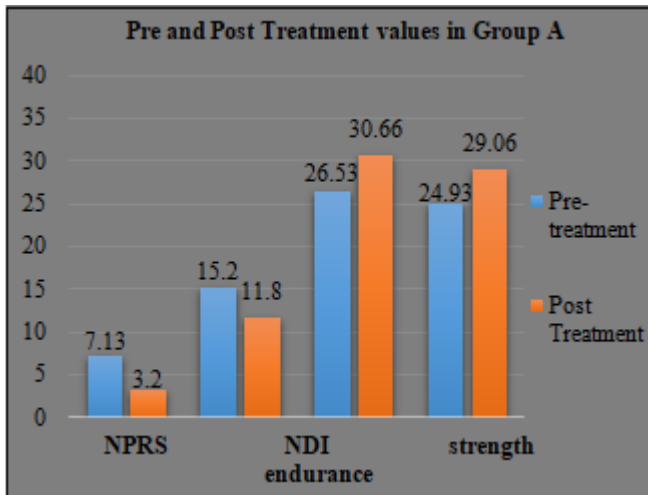
Pre and post-treatment data of the participants of both groups were noted. All statistical analysis was done using SPSS 26 software for windows. Descriptive analysis was obtained by using mean & standard deviation. The intergroup comparison between Group A and B of pre-treatment and post-treatment of NPRS, NDI and cervical muscle strength and endurance was done by paired t-test. The intragroup comparison of pre-treatment and post-treatment of NPRS, NDI and cervical muscle strength and endurance within Group A and Group B was done by unpaired t-test.

Table 3: Pre and Post treatment values of Group A

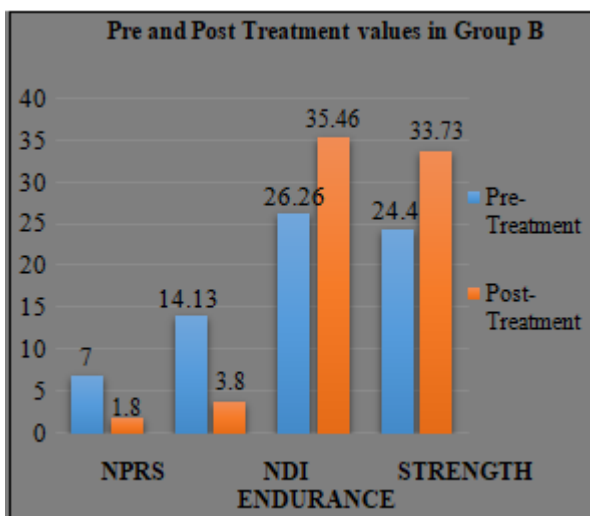
Group A	Pre-Treatment Mean ± SD	Post-Treatment Mean ± SD	t-value	p value
NPRS	7.13 ± 0.99	3.2 ± 1.08	19.07	0.00
NDI	15.2 ± 1.48	11.8 ± 1.85	9.53	0.00
Cervical Muscle strength	26.53 ± 2.19	30.66 ± 1.95	-11.374	0.00
Cervical Muscle Endurance	24.93 ± 1.98	29.06 ± 1.98	-10.02	0.00

Table 4: Pre and Post Treatment values of Group B

Group B	Pre-Treatment Mean ± SD	Post-Treatment Mean ± SD	t-value	p value
NPRS	7 ± 0.84	1.8 ± 0.67	18.608	0.00
NDI	14.13 ± 2.16	3.8 ± 1.01	14.19	0.00
Cervical Muscle strength	26.26 ± 1.83	35.46 ± 2.06	-13.722	0.00
Cervical Muscle Endurance	24.4 ± 1.72	33.73 ± 1.48	-20.088	0.00



Graph 1: Pre and Post-Treatment values in Group A



Graph 2: Pre and Post-Treatment values in Group B

The results found in this study disclosed that after a six-week treatment program, both groups, Group A, who received conventional exercises program only and Group B who received Pilates along with conventional exercises program attained a significant improvement in the strength and endurance of neck flexor muscle and reduced pain and disability. But statistically greater significant improvement was seen in Group B as compared to Group A (p value < 0.05).

4. Discussion

Smart phones are now playing a big role in people's lives. When using a Smartphone, people usually bend their neck downwards to stare at the lowered object and maintaining the head in forward position for longer periods of time.^[5] Using mobile phones in abnormal posture for a long time puts more strain on neck muscles. All this leads to neck pain, soreness and reduce in the muscle strength and endurance of the cervical muscles especially the deep flexor muscles. Text neck is the most commonly term used for neck pain and soreness due to prolonged use of mobile in abnormal position or posture.

Exercise is the most effective way to treat the patients with neck pain. In case of neck pain, the majority of treatment

protocols focus on the deep neck flexors, as they play a major role in stabilizing the proper alignment of the cervical spine.

Previous research on Text Neck suggests that weakened postural muscles should be strengthened and shortened muscles should be lengthened to improve postural alignment and to alleviate Text Neck Syndrome.

A study that was conducted by Having JL stated that chin tuck-in exercise helps to strengthen deep cervical flexors and head bending exercise improves the endurance of cervical flexors muscles, helps to reduce the pain in patients suffering from chronic cervical pain and also helps to improve their muscular functions.^[10]

Also a study reported that both stretching and postural changes were effective equally to reduce neck pain and another study reported that both stretching and manual therapy, considerably decreased pain in neck and disability in women with non-specific neck pain.^[16]

Pilates is described by as a unique technique of physical fitness that uses a combination of muscle lengthening and strengthening along with breathing control in order to develop core muscles and to restore muscle balance".^[12] 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).^[11] Pilates works by combining breathing techniques with special stretches.^[12]

A study showed that spinal stabilization exercises like Pilates benefits to manage back and neck pain (Moffett & McLean, 2006). Neck pain is mainly associated with an inefficiency in the deep cervical flexor muscles. Thus re-educating the stabilizing (postural) muscles of the spine and shoulder girdle, with the help of Pilates have beneficial effects to manage back pain and restore function.^[12]

Pilates helps by encouraging activation of the 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.

The results of the study showed a significant improvement in the outcome measures in post-treatment stage as compared to the pre-treatment stage. Though a significant improvement was found after treatment in both the groups, but Group B showed greater improvement in the NDI Score, NPRS Score, Cervical Muscle Strength and Endurance. (p value < 0.05).

5. Conclusion

In the experimental conditions used in the study, both the groups showed significant improvement in pain, disability, cervical muscle strength and endurance. The use of Pilates along with Conventional Exercise Program evidenced a significantly greater improvement in reducing pain, neck disability, increasing cervical muscle strength and endurance

when compared to Conventional Exercise Program alone (Group A)

6. Future Scope

- 1) The study can be done with long term follow up.
- 2) The study can be done with longer treatment duration.
- 3) The study can be revised involving a larger sample size.
- 4) Individuals of elder age group can be studied.
- 5) Further studies can be taken up with different intervention procedures and parameters for improving cervical muscle strength and endurance.

Conflict of interest: None

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