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POSTURAL CORRECTION AND EXERCISE'S EFFECTS ON NECK PAIN IN CELL PHONE USERS IN PAKISTAN

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neck pain , Cell phone, levator scapulae, trapezius, sternocleidomastoids, trigger points, text neck syndrome, stretching exercises.

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Abstract

Objective: *Long-term use of a cell phone in the head forward position increases the risk of developing trigger points (TP) and myofascial pain syndromes (MPS). The goal of this study was to assess the relationship between mobile phone use-related neck discomfort and MPS in the trapezius, sternocleidomastoid, and levator scapulae (LS) muscles, as well as to recommend an effective treatment strategy.*

Materials and Methods: *This study included 40 patients with neck discomfort who reported using a mobile phone. These patients were split into two groups of 20 at random. The trapezius, sternocleidomastoids, and LS muscles were assessed for the presence of taut bands and the intensity of pain. Additionally, range of motion (ROM) and the intensity of neck pain were evaluated. Participants in Group 1 were given a structured exercise program and posture correction instruction, whereas Group 2 was not assigned any correction therapy. The participants were re-evaluated after one month, and their parameters were compared to those during the initial examination.*

Results: *This research had a total of 40 patients (20 from each group). In group 1, the neck pain score reduced dramatically from 56.3±21.2 mm to 28.5±17.3 mm ($p<0.001$), and the taut band of the right levator scapulae muscle vanished ($p=0.004$). TP pain intensity decreased significantly in the left sternocleidomastoids ($p=0.038$), left trapezius ($p=0.030$), and right LS ($p=0.011$) muscles. In group 1, there was slightly decrease in discomfort in the left levator scapulae muscle, although it was not statistically significant ($p=0.056$). However, group 2's neck pain severity score (48.1±22.0 mm to 39.4±19.9 mm, $p=0.123$), taut band presence, and TP severity of pain did not alter significantly after one month.*

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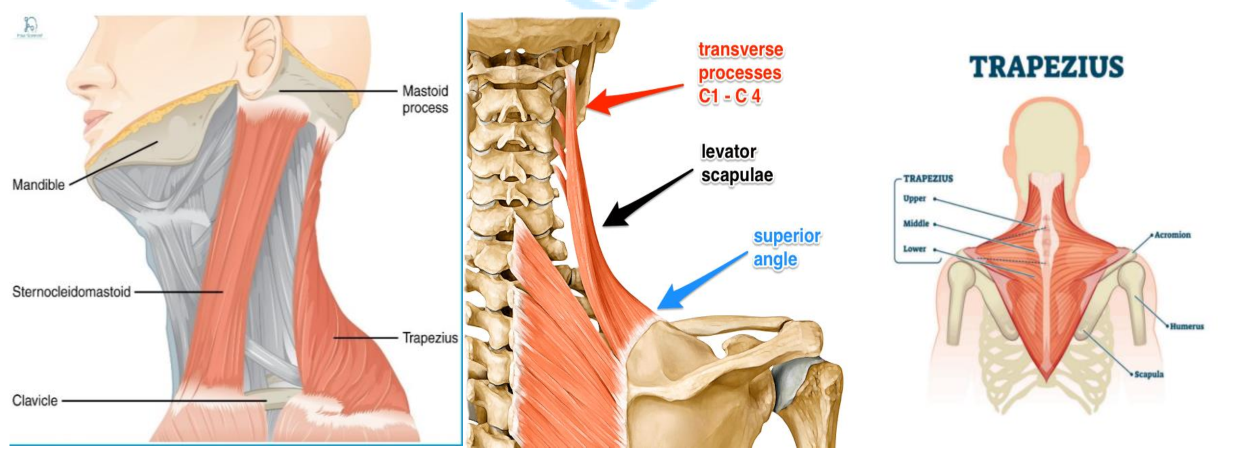
Conclusion: *Limiting the amount of time spent on a cell phone, exercising regularly, and correcting the head forward position by improving awareness can all help prevent text neck syndrome.*

INTRODUCTION:

One of the most common musculoskeletal complaints among young people is neck pain. According to recent research, a 12-month incidence of around 29% which indicates that neck discomfort continues to remain fairly common in the general population (1). One of the most common causes of neck and thoracic discomfort is myofascial pain syndromes (MPS) (2). Trigger points (TP), taut bands, pressure sensitivity, and referred pain are characteristics of MPS (3).

Long-term usage of a mobile phone in an unnatural position increases neck muscular tension and induces TPs and MPS. Additionally, it was noted that preventing or exacerbating MPS was significantly influenced by avoiding the aggravating variables (4). The weight supported by the neck is around five kilograms (kg) when the head is in its neutral position, which is 0 degrees. Recent biomechanical experiments have shown that this weight rises dramatically with neck flexion (5).

Neck muscle-related symptoms have grown in recent years due to the higher prevalence of mobile phone use and longer usage times. As a result, individuals exhibit postural abnormalities, acute and chronic musculoskeletal discomfort, and chronic weariness. Untreated, this disorder may cause long-term alterations include early spinal degenerations, spinal misalignment, and flattening of the cervical spinal curve (6). Inaccurate postures during desk work and phone usage are linked to a higher risk of posture-related aberrations, such as improper cervical lordosis, according to recent research employing inertial measurement unit (IMU)-based sensors (7).



Cell phones are becoming an increasingly significant part of our lives in addition to being used more and more. Consequently, "text neck"—a phrase used to describe cervical spine degeneration brought on by repeated forward head flexion while staring down at mobile devices—is becoming more prevalent (8). Recent research indicates that text neck syndrome has become a serious health issue that might impact millions of people worldwide, especially children and teenagers (9).

Previous research has demonstrated a link between cell phone use and neck pain. Gustafsson et al. (10) discovered an association among text messaging and neck/upper back discomfort. Berolo et al. (11) discovered that cell phone use is associated with neck and shoulder discomfort. The population's knowledge of text neck syndrome has been discovered to be quite poor.

Frontier in Medical & Health Research
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The general public's knowledge of text neck syndrome is still limited, according to Samani et al. (12). These findings demonstrate the need to educate people about text neck syndrome and how to avoid it.

Three of the most often affected muscles, the trapezius, sternocleidomastoids, and levator scapulae (LS), were investigated in our study due to their critical roles. The trapezius muscle is primarily responsible for posture, reported neck/shoulder discomfort severity, and muscular sensitivity (13). The sternocleidomastoid's, which is in charge of head and neck flexion, sometimes has many TPs. One of the main muscles involved in the development of TP and neck discomfort is the LS. "Stiff neck" (markedly restricted rotation) is typically caused by TPs in LS (3). TPs are often detected in these muscles and are linked to discomfort and impairment, according to recent studies (14). These muscles were chosen for our study based on their accessibility during the physical examination in addition to the previously indicated characteristics.

The purpose of this study was to avoid text neck syndrome and raise public awareness. This study also aimed to assess the relationship between cell phone use-related neck discomfort and MPS in the trapezius, sternocleidomastoids, and LS muscles and to identify a suitable treatment strategy by offering a structured exercise regimen and posture correction guidance.

MATERIALS AND METHODS:

This study was conducted in the Department of Physical Medicine and Rehabilitation at the Superior University in Lahore, Pakistan. This study included 40 participants (18 men and 22 women) who complained of neck discomfort and used cell phones. The patients were students and desk workers.

Neck discomfort, using a mobile phone for at least two hours per day for five years, and being between the ages of 15 and 40 were all considered inclusion criteria. Exclusion criteria included prior neck-head trauma, a history of surgical procedure in the neck area, neurological deficiency, significant neck pain requiring medical care, vertebral disc disease with radiculopathy or inflammatory or malignant pain, and systemic disorders.

Patients who came to our department's outpatient clinic complaining of discomfort in various parts of their musculoskeletal system were assessed. Patients who met the inclusion and exclusion criteria and suffered neck discomfort were deemed appropriate for our clinical investigation. The patients were split into two groups of twenty at random: group 2 (control group) and group 1 (treatment group). While patients in group 2 got no therapy, those in group 1 received an organized exercise regimen and written and verbal counsel on correcting their posture.

All patients received comprehensive information regarding the study prior to the assessment, and formal consent forms were acquired. The health-related history, inspection, palpation, and neck range of motion (ROM) examination were the four components of the examination. The patients' history was thoroughly investigated, and age, body mass index (BMI), occupation, daily cell phone and computer usage, number of years since regular cell phone use, time frame of pain, pain characteristic symptom and reference pattern, both aggravating and relieving factors, posture during cell phone use, sport activity, and smoking history were all recorded.

The Visual Analog Scale (VAS) was used to assess pain intensity at the initial assessment and again one month later. Additionally, VAS measures were saved as millimeters. During the examination, individuals were assessed for shoulder asymmetry, cervical lordosis, and dorsal postural abnormalities. During palpation, the sternocleidomastoids, trapezius, and LS muscles were examined for tight muscular bands and the presence of TP. While pressing, participants were asked to assess their pain level as grade 1 (mild), grade 2 (moderate), or grade 3 (severe). During the neck ROM test, patients were examined for discomfort and limitations in neck motions. Patients in group 2 were encouraged to go about their normal lives and not receive any extra

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Figure 8. Lateral neck stretch in lying position

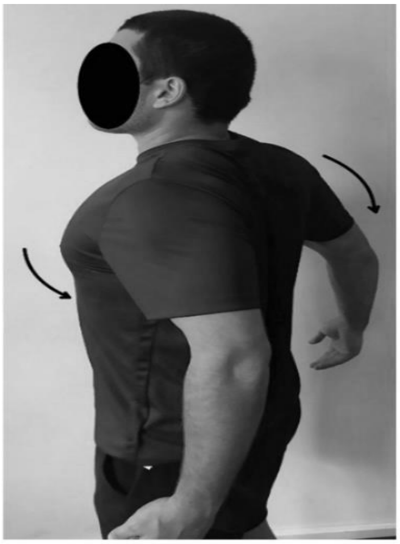

Figure 9. Standing chest stretch

Figure 7. Lateral neck stretch in standing position

Figure 6. Levator scapulae stretch

Figure 5. Isometric neck extension exercise

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Figure 4. Neck rotation exercise

Figure 10. Shoulder roll exercise

Exercise program

medicine or therapy. Patients in group 1 were given a planned exercise program that included neck muscular stretching and posture exercises, as well as instructions to execute exercises in 10 repetitions and 2 sets each day. In addition to workouts, participants were given guidance on correcting posture and limiting mobile phone usage. The written posture advice was given which was as fellow:

{Please hold your mobile phone, personal computer, and other electronic devices at eye level. Please take a break every 20 minutes when using these gadgets. Please handle large and heavy electronic devices, such as tablets and cell phones, with both hands. Please read books or newspapers at eye level. When using a cell phone, avoid typing repetitively and scrolling the screen for extended periods of time. Try not to slouch forward while using technological gadgets.}

Participants in group 1 were also educated about a cellphone application that sends notifications when their head position changes. According to recent studies, mobile-based applications can effectively manage text neck syndrome, providing significant pain reduction and enhancement in functionality (15). Every patient was advised to contact the doctor right away if they had any adverse effects or if their level of pain significantly increased. Patients were summoned for control one month following the initial evaluation. The VAS was used to evaluate the patients' pain intensity once more during the follow-up evaluation. Neck range of motion, TPs, and taut bands were evaluated in this follow up visit.

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STATISTICAL ANALYSIS:

During the ROM evaluation in groups, the McNemar test was used to assess the significance of the presence of taut bands and any discomfort or disability. The Mann-Whitney U test was used to assess the VAS pain score. Pain severity in TPs was assessed using the Wilcoxon Signed Ranks test. All statistical analyses were performed using SPSS 21.0 (IBM, USA), and statistical significance was presumed when the p-value was less than 0.05.

RESULTS:

From a total of 40 patients, 20 in group 1 and 20 in group 2 completed this study. Table 1 shows the patient demographics and pain characteristics that were recorded at the initial assessment. Males made up 44.6% (n=18), while females made up 55.4% (n=22) of the patients. The individuals had a mean age of 26.6±7.4 (mean ± SD) and a mean BMI of 22.5±3.1. Every patient complained of neck pain that was mechanical in nature. Of the patients, 65.0% (n=26) said that their pain was referred to various areas, particularly the shoulders, head, back, and arms.

The physical examination revealed that cervical lordosis in 55.0% (n=22) of patients. Shoulder asymmetry, particularly depression of one shoulder, was observed in 30.0% (n=12) of patients. The intensity of neck discomfort was measured using a VAS pain score at baseline and one month later. The pain score in group 1 was 56.3±21.2 mm (mean ± SD) in the first evaluation, and 28.5±17.3 mm (mean ± SD) in the second assessment. Group 1 had significantly lower VAS pain scores ($p<0.001$). In contrast, there were no significant differences in group 2 ($p=0.123$). The pain severity ratings for Group 2 were 48.1±22.0 mm (mean ± SD) in the first evaluation and 39.4±19.9 mm (mean ± SD) in the second (Table 2). Patients were evaluated based on the presence a tight band and the intensity of their TP discomfort when palpated. In group 1, only the taut band of the

Characteristic	Value	Characteristic	Value
Age (years)	26.5±7.4	Aggravating factors of pain	
Body mass index	22.4±3.1	Phone using	57.5% (n=23)
Gender		Others	42.5% (n=17)
Female	55.4% (n=22)	Alleviating factors of pain	
Male	44.6% (n=18)	Stretching	47.5% (n=19)
Occupation		Resting	37.5% (n=15)
Student	58.1% (n=23)	Both	15.0% (n=6)
Desk workers	41.9% (n=17)	**Number of years since regular cell phone using (years)**	
		<10	35.0% (n=14)
Referred pain		10-20	55.0% (n=22)
Yes	65.0% (n=26)	>20	10.0% (n=4)
No	35.0% (n=14)	**Daily phone usage (hours)**	
Onset of pain (months)		<3	30.0% (n=12)
<1	5.0% (n=2)	3-6	47.5% (n=19)
1-6	5.0% (n=2)	>6	22.5% (n=9)
>6	90.0% (n=36)	**Posture during phone use**	

Frontier in Medical & Health Research
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Is pain continuous or intermittent?		Sit and bend forward	80.0% (n=32)
Continuous	35.0% (n=14)	Lie on back	7.5% (n=3)
Intermittent	65.0% (n=26)	Both	12.5% (n=5)
Frequency of pain (in one week)		**Pain aggravating posture during phone use**	
<3	60.0% (n=24)	Sit and bend forward	85.0% (n=34)
>6	40.0% (n=16)	Lie down	7.5% (n=3)
Regular sport activities		Both	7.5% (n=3)
Yes	58.1% (n=23)	**Daily personal computer usage (hours)**	
No	41.9% (n=17)	<3	35.0% (n=14)
Cervical lordosis		3-6	12.5% (n=5)
Decreased	55.0% (n=22)	>6	52.5% (n=21)
Normal	45.0% (n=18)	**Smoking**	
Shoulder asymmetry	30.0% (n=12)	Yes	32.5% (n=13)
		No	67.5% (n=27)

right LS had considerably disappeared (p=0.004); however, there were no significant alterations in the studied muscles in group 2.
In group 1, the degree of pain was considerably reduced in the left sternocleidomastoids (p=0.039), left trapezius (p=0.031), and right LS (p=0.012) muscles (Table 3). The pain reduction in the left LS muscle was borderline, but not statistically significant (p=0.056). There were no significant differences in TP pain in group 2 (Table 4). Pain and restriction during neck ROM assessment showed no significant differences between the first and second examinations in either group.
Table 1. Patient data and pain characteristics (N=40) –

Table 2. Comparison of patients' Visual Analog Scale neck pain score between the 1st and 2nd measurement among both groups.

Group	1st Measurement Mean ± SD (mm)	2nd Measurement Mean ± SD (mm)	p-value
Group 1 (n=20)	56.3 ± 21.2	28.5 ± 17.3	p<0.001*
Group 2 (n=20)	48.1 ± 22.0	39.4 ± 19.9	p=0.120

Frontier in Medical & Health Research
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Table 3. Group 1 patients' trigger point pain severity and significance of difference between 1st and 2nd examinations (n=20)

Muscles	1st Examination				2nd Examination				p-value
	Painless	Mild pain	Moderate pain	Severe pain	Painless	Mild pain	Moderate pain	Severe pain	
M. sternocleidomastoids right	50.0% (10)	15.0 % (3)	25.0% (5)	10.0 % (2)	75.0% (15)	10.0 % (2)	15.0% (3)	0.0% (0)	0.176
M. sternocleidomastoids left	50.0% (10)	25.0 % (5)	20.0% (4)	5.0% (1)	85.0% (17)	15.0 % (3)	0.0% (0)	0.0% (0)	0.039 *
M. trapezius right	40.0% (8)	25.0 % (5)	20.0% (4)	15.0 % (3)	45.0% (9)	20.0 % (4)	25.0% (5)	10.0 % (2)	0.381
M. trapezius left	45.0% (9)	20.0 % (4)	25.0% (5)	10.0 % (2)	70.0% (14)	15.0 % (3)	15.0% (3)	0.0% (0)	0.031 *
LS right	45.0% (9)	20.0 % (4)	25.0% (5)	10.0 % (2)	75.0% (15)	15.0 % (3)	10.0% (2)	0.0% (0)	0.012 *
LS left	40.0% (8)	20.0 % (4)	30.0% (6)	10.0 % (2)	55.0% (11)	10.0 % (2)	35.0% (7)	0.0% (0)	0.056

Frontier in Medical & Health Research
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Table 4. Group 2 patients' trigger point pain severity and significance of difference between 1st and 2nd examinations (n=20)

Trigger point location	1st Examination				2nd Examination				p-value
	Painless	Mild pain	Moderate pain	Severe pain	Painless	Mild pain	Moderate pain	Severe pain	
sternocleidomastoids right	60.0% (12)	10.0 % (2)	20.0% (4)	10.0 % (2)	50.0% (10)	15.0 % (3)	25.0% (5)	10.0 % (2)	0.321
sternocleidomastoids left	60.0% (12)	15.0 % (3)	15.0% (3)	10.0 % (2)	60.0% (12)	10.0 % (2)	20.0% (4)	10.0 % (2)	0.717
trapezius right	65.0% (13)	15.0 % (3)	10.0% (2)	10.0 % (2)	55.0% (11)	15.0 % (3)	20.0% (4)	10.0 % (2)	0.324
trapezius left	70.0% (14)	10.0 % (2)	15.0% (3)	5.0% (1)	60.0% (12)	15.0 % (3)	15.0% (3)	10.0 % (2)	0.099
LS right	45.0% (9)	25.0 % (5)	15.0% (3)	15.0 % (3)	55.0% (11)	20.0 % (4)	15.0% (3)	10.0 % (2)	0.301
LS left	60.0% (12)	15.0 % (3)	10.0% (2)	15.0 % (3)	60.0% (12)	15.0 % (3)	15.0% (3)	10.0 % (2)	0.396

DISCUSSION

Our study's objective was to characterize the connection mobile phone users' neck discomfort, MPS, and treatment outcomes. There has been much discussion about neck discomfort, its connection to electronic device use, and its association with MPS. This research evaluated outcomes between treatment and control groups by measuring changes in patients' VAS neck pain score, TP discomfort, taut band existence, and neck range of motion.

The population in our study was made of desk workers (41.9%, n=17) and students (58.1%, n=23). Neck pain is becoming a prevalent complaint among students and desk workers, along with regular use of electronic devices and prolonged head-forward position. Recent research indicates that extended smartphone use is an important contributor to the high frequency of neck discomfort among young individuals (9,16).

Relapses are common since the majority neck pain patients have an episodic course over the course of a lifetime. Neck pain lasted longer than six months in 90.0% (n=36) of our patients, indicating that chronic musculoskeletal pain issues are more likely to develop if neck pain is not appropriately managed. The average duration to diagnosis for cervical spine injuries is around 4.2 months, according to recent study, underscoring the chronic nature of these diseases. (17).

Long-term mobile phone use, including frequent texting, and gaming, has been linked to the development of neck discomfort (11,18). In this study, 47.5% (n=19) of patients stated that their daily phone usage ranged from 3 to 6 hours. This conclusion was comparable with the research undertaken by Berolo et al. (11), which found a mean of 4.6±5.6 hours. A total of 55.0% (n=22) of our patients reported using a mobile phone for 10 to 20 years. Our patients' mean age [27.6±7.4

Frontier in Medical & Health Research
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years] is comparable with recent epidemiological findings on smartphone-related neck discomfort (9).

Neck discomfort problems are on rise as cell phones gain popularity. In our study, 57.5% (n=23) of patients reported that mobile phone use caused or exacerbated their neck pain. Different researchers evaluated complaints related to long-term use of mobile devices, and the most prevalent symptom was neck pain. Neck pain symptoms have been shown to differ significantly among demographics, with recent research indicating a high incidence among young individuals (9, 19).

We discovered that our most often stated posture during phone usage was sitting and leaning forward (80.0%, n = 32). Furthermore, these patients reported that this position was to blame for the worsening of their neck discomfort (85.0%, n=34). This conclusion is consistent with current research, which describes text neck syndrome as a direct result of prolonged neck flexion when using a smartphone (9). Several studies have also investigated the association between neck position and neck discomfort. Recent research has found that increasing cervical flexion causes a considerable increase in muscular fatigue and soreness in the muscle of the upper trapezius (20). Furthermore, Syamala et al. (21) found that holding a mobile phone at eye level with sufficient body support during use can lower biomechanical stress on neck muscles and upper extremities.

In this study, we found no significant difference patients' limitations and discomfort during neck ROM assessment in the two groups. However, recent study has shown that planned exercise regimens help increase cervical ROM in neck pain patients (22). One possible reason for this disparity is that our patients did not exercise on a regular basis. Another rationale is that limited neck range of motion was not an inclusion requirement in our study, hence no change was noticed.

Cervical lordosis was shown to be in 55.0% of patients (n=22). According to recent studies, mobile phone use reduces cervical lordosis (23). Recent research employing IMU-based sensors has found that extended smartphone use is related with considerable changes in cervical sagittal alignment (7). Furthermore, a recent study found that reduced C2-7 cervical lordosis angle and cervical tilt angle are linked with greater pain levels in individuals with myofascial pain syndrome (24). The VAS neck pain score significantly decreased 56.3±21.2 mm to 28.5±17.3 mm, $p<0.001$) in the treatment group following a one-month exercise program and posture correction recommendations. The efficacy of manual treatment techniques and organized exercise regimens in lowering pain and trigger points in individuals with cervical MPS has been validated by recent RCTs (25).

All of our patients had tight and TPs in various muscles and different places. TPs are frequently seen in the thoracic and neck muscles, and they frequently generate secondary TPs (8). According to a recent study by De-La-Hoz-López et al. (14), each patient had an average of 12 trigger points in their cervical muscles, and activated trigger points were linked to pain and impairment. Our findings supported the current knowledge of myofascial pain patterns by demonstrating a correlation between the existence of TPs in the sternocleidomastoids and the presence of TPs in the trapezius muscle and the LS.

In our study, patients who completed exercise program and followed posture guidance for one month had substantially lower TP pain severity in the left sternocleidomastoidous ($p=0.039$), left trapezius ($p=0.031$), and right LS ($p=0.012$) muscles in group 1 (Table 3). Furthermore, the left LS ($p=0.056$) demonstrated reduced discomfort but did not achieve statistical significance. There were no significant differences in TP pain in group 2 (Table 4). Group 1 had considerably less taut bands in the LS ($p<0.05$). Kosek et al. (25) found that myofascial release treatment with regular physical therapy significantly improved pain, trigger point counts, and pressure pain threshold in individuals with cervical MPS. Furthermore, reduced myofascial TP sensitivity in response to passive stretch has been widely established in individuals with myofascial head and neck discomfort (26).

Our study's strength was that, several research have shown a link between neck discomfort and mobile phone use, relatively few of them have addressed

Frontier in Medical & Health Research
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therapy. The participants in our trial were given guidelines for correcting their posture and limiting their use of cell phones, along with a structured neck training regimen. After a month of therapy, a follow-up examination was performed on each patient. The effectiveness of physiotherapy and rehabilitation strategies, including as neck stability, low-load endurance, cervical spectrum of motion exercises, posture-based exercises, and stretching techniques, in alleviating the symptoms of text neck syndrome has been supported by recent reviews (9).

STUDY LIMITATIONS: Our study's limitations included the fact the assessments were not conducted blindly. The other constraint was that workouts needed to be done for two to three months to achieve maximum results. Future research studies may benefit from a prospective follow-up of patients over longer periods of time.

CONCLUSION

Cell phone usage has surged in recent years. As a result, the number of persons reporting neck pain from cell phone use is increasing. Limiting cell phone usage and improving forward head posture through increased awareness should be encouraged. Furthermore, a planned neck exercise program carried out on a regular basis should aid in the prevention and treatment of text neck syndrome.

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