
Immediate Effect of Posture Correction of Trapezius Activity in Computer Users Having Neck Pain – An Electromyographic Analysis

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ABSTRACT

Objectives: Aberrant activity of the trapezius muscle and associated postural abnormalities have been identified as potential factors for neck pain in computer users, thus postural correction is often advocated. The purpose of this trial was to examine the effect of specific scapular postural correction exercises on middle and lower trapezius activity. **Methods:** Sixty participants matched for the duration of daily computer use were included in the study. Twenty had no neck pain and exhibited “good” scapular posture (constituting Control group C), while forty reported pain (Neck Disability Index $\geq 15/100$) for ≥ 3 months over 12 month period. The latter were randomly allocated to one of the two groups (A and B). Electromyographic recordings were taken from the middle and lower trapezius at rest and during typing. After 20-minutes of typing participants in group A (n=20) practiced scapular postural correction exercises while participants in group B (n=20) relaxed. Electromyographic recordings were repeated in a second typing task. **Results:** Following correction of the scapular posture in group A, middle trapezius activity became similar to the control group ($P = 0.229$) with no effect on lower trapezius activity ($P < 0.001$). Significant normalization did not occur after relaxation exercises ($P = 0.004$). **Conclusion:** Intermittent scapular postural correction exercises were effective in altering the middle and lower trapezius activity during computer use and may be advised for prevention of neck pain.

INTRODUCTION

For people who spend a great deal of time using computers, Work Related Musculoskeletal Disorders (WRMSDs) of the neck are a common problem (often called work related neck pain or WRNP).^{1,2} In fact, recent reports on prevalence data for neck pain in office workers suggest the one year prevalence to be 17.7% to 63%.^{1,3-5}

Neck pain in computer users has a multifactorial origin. In the case of desktop users, repeated stroking of keys and weakness of distal upper limb musculature have been important risk factors, while in laptop users, the inability to align the head and body has a major role to play.⁶⁻⁹ There are various other extrinsic and intrinsic risk factors including time constraints, high workloads, mechanical vibrations, extreme temperatures, psychological stress, specific personality traits, etc., that are known to increase problems for computer users having neck pain. This is apparent from immediate changes in electrical activity of the trapezius muscle with the commencement of typing, which vary proportionately with the number of risk factors.^{10,11}

Actually, even if the risk factors are minimized, the nature of computer-tasking is such that prolonged and repeated muscle contractions are desirable. Despite the fact that these contractions are of very low intensities, they have known to be associated with the production of “low frequency fatigue (LFF).”¹²⁻¹⁴ As a result of slow recovery, the effects of fatigue persist and lead to the risk of intramuscular accumulation of pain-producing substances.¹² The body tries to accommodate to LFF by adopting “relaxed” postures.¹¹

During typing, it is the trapezii that are the site of development of “LFF” because they work continually as proximal stabilizers for the upper extremity muscles and extensors of neck.^{15,16} The “relaxed” postures are, scapular abduction, elevation, downward rotation or forward head/neck protrusion. Since these postures are biomechanically inefficient, optimum muscle contractions cannot be obtained to support the alignment of body parts. This produces pain even if it was not manifested before because of the body’s compensatory mechanisms. Hence, not only does neck pain lead to postural alterations in computer users, but poor postures may also perpetuate chronic pain mechanisms. Logically, it follows that such pain should cease immediately on change from the painful position.¹¹

Posture correction using taping techniques, stretching exercises, verbal cueing, endurance exercises, relaxation exercises, mobilization, and soft-tissue manipulation has been advocated in the past.¹⁷⁻¹⁹ It has been concluded that in order to have long-term benefits, posture retraining should involve re-education of awareness of correct posture and encouragement to actively maintain it. If this proposition is valid, there should be immediate alteration in the trapezius activity after such an intervention. However, there exists a dearth of such data. Therefore, to gain a deeper insight into one of the proposed mechanisms of pain production in computer users, the purpose of this trial was to investigate the immediate effects of scapular posture re-education/correction on activity of the middle and lower trapezius musculature.

A scapular proprioception restoration protocol constituting a few simple and easily understandable exercises was used in the study (APPENDIX I). Electrical activity of the trapezii was used as the outcome measure because poor neck postures have been linked directly to aberrant electrical activity of the scapular muscles.^{16,20-24} While there is ample evidence for the effect on upper fibers, possibly because of the ease of recording, middle and lower trapezii remain less investigated. Hence in this study, recordings from the middle and lower trapezii were investigated.

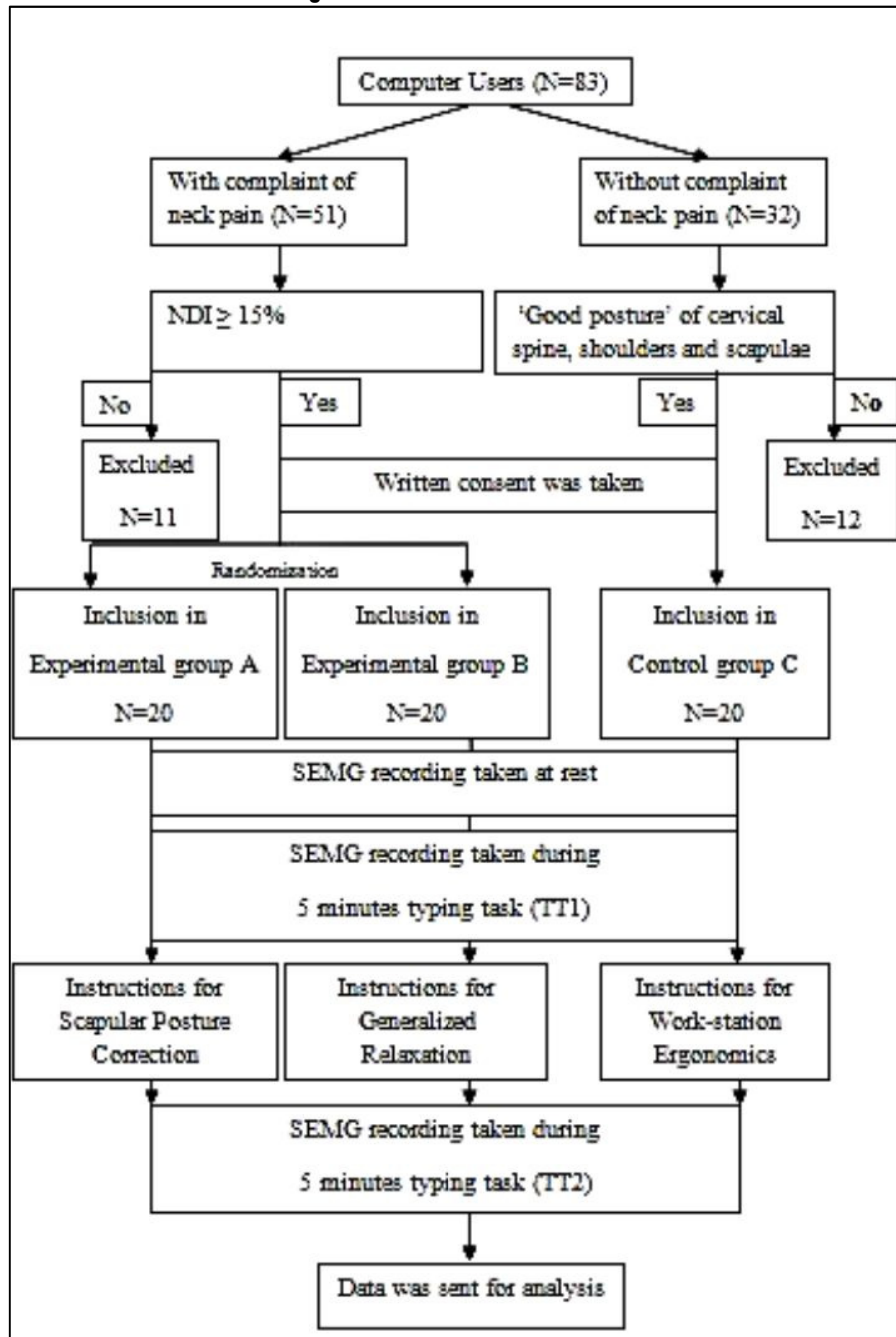
MATERIALS AND METHODS

The trial was embedded in the normal daily process of physiotherapy clinics of the National Institute for the Orthopedically Handicapped (NIOH) Kolkata for 10 months. Institutional Ethical Committee (IEC) clearance was obtained. Both male and female computer users 20 to 40 years old were selected from amongst the staff and students of the Institute if the duration of daily computer usage (laptop or desktop) was ≥ 4 hours per day on at least five days of week for more than one year.⁶ The age group chosen was based on the population availability (> 20 years), epidemiological studies (maximum incidence 20 to 60 years), and presentation of degenerative changes (> 40 years).

Participants with no neck pain who displayed good scapular posture were included in control group (C). “Good” scapular posture meant that scapulae lay flat against the upper back, approximately between the second and seventh thoracic vertebrae, and 3 to 4 inches apart (although on the higher side of suggested norms, this was chosen because inferior scapular angles were taken as the point of reference for measurement).¹⁶ This was assessed through visual analysis.^{16,25,26} The side that most accurately displayed scapular mid-position was chosen as the test side. It was supposed that controls who displayed good posture would ultimately display ideal trapezius muscle behavior. This recording was taken to compare the electrical activity in patients having pain.

Participants with chronic neck pain were included into the experimental group if the duration of pain was ≥ 3 months over a 12-month period, and disability from pain revealed a minimum score of 15/100 on the Neck Disability Index (NDI).²⁷⁻³⁰ (Note that 15/100 is somewhat more than the minimal clinically significant score of 10/100 so there is less chance of error, and it is not too high for the age group of 20 to 40 included in the study.) Exclusion was based on a history of traumatic incident/neck surgery, cervical radiculopathy/neurological signs, carpal tunnel syndrome, connective tissue disorder or other systemic illness, shoulder pathology, or inability to read and write English. Participants in the “pain group” were randomly allocated into 2 sub-groups: Group A and Group B by chit-box method, and a written consent was taken (Figure 1).

Figure 1. Flowchart of Procedure



Group A participants were given scapular proprioceptive exercises between the typing tasks (APPENDIX I) while Group B participants were instructed to relax by guided imagery.

There were three stages of the study: a pre-intervention 15 minute typing task (TT1), a 5-minute break (intervention given) followed by a post-intervention second typing task (TT2) for 15 minutes; this was explicitly explained to the participants. Then they were made to sit comfortably at a standard office work-station on an adjustable chair with arm supports and feet supported on resting bars (Figure 2). The ergonomic guidelines as given by the Cornell University Ergonomics Center for the lumbar spine were followed. All participants were instructed to make individual changes for their comfort.

Figure 2. Simulated Work Station Set Up

Surface electromyography (SEMG) was used to obtain myoelectric signals from the middle and lower portions of the trapezius muscle because ample evidence exists for upper trapezius activity.³¹ Pairs of electrodes were placed unilaterally adjacent to the spinous process of T2/T3 for the middle trapezius (MT) muscle. Electrodes for the lower trapezius (LT) were placed along the line between T5 and the acromion. Ten millimeter (10 mm) adhesive bipolar surface electrodes (Ag/AgCl Electrodes, MSGST-06, Medico Lead-Lok, Medico Electrodes International, India) were used with a center-to-center inter-electrode distance of 40 mm.³² The reference electrode was placed over the opposite ankle of the extremity being tested. Prior to attachment of the electrodes, the participants' skin was prepared by cleaning the shaved area with isopropyl alcohol. An 8-channel SEMG apparatus was used (Power Lab 8/30, AD Instruments Pty. Ltd., Australia). The SEMG signal was bio-amplified (low-pass filtered at 2000 Hz, high pass filtered at 1 Hz). The sampling rate was 1000 Hz. Fifty Hz notch was maintained. Range/bandwidth was set at 1mV. The SEMG signals thus obtained were processed by the Chart 5 software connected to the EMG apparatus, and the root-mean-square (RMS) value was obtained.

First, a SEMG recording was taken at rest for 30 seconds prior to commencement of the typing task. Participants were then asked to type continuously at their normal pace for 15 minutes. No word limit was defined since "time pressure" is known to induce "central fatigue" and increase generalized muscle tension. A copy-typing program, Bruce's Typing Tutor (Rozland Productions, Version 1.5), was used to display the text on the computer screen (Screen resolution: 1024 X 768 pixels; color quality: 32 bit). Error correction was allowed using the backspace key.

The participants then underwent the second stage of the study. Group A participants were instructed as pertinent to make them aware of the correct posture. To apprise the participants of elevation and depression, instructions included “shrug your shoulders by trying to touch the shoulders to the ears and bring them down as much as you can.” For upward and downward rotation, instructions were “gently lift the tip of the shoulder and drop it as much as you can” and for protraction and retraction, “gently spread the front of your shoulders apart to draw your shoulder blades across your chest wall and then bring the tip of both your shoulders forwards as in trying to reach forward.” The scapular orientation of the individual subject with reference to the ideal posture was also explained. The participants practiced the posture reorientation exercises for 5 minutes or until satisfactory correction as judged by the physical therapist was achieved, whichever occurred sooner.

Group B participants were instructed to relax by closing both eyes for 5 minutes and imagining being on a sunny beach while Group C participants were free to discuss the ergonomic considerations for the workplace during that time.²⁵

SEMG data was recorded for the second typing task, and all the patients were discharged with handouts providing them information on ergonomically efficient work postures and a home exercise program for cervico-brachial strength and flexibility maintenance.³³ (APPENDIX II)

Data concerning the demographic details and significant assessment findings of the participant were recorded daily on the data collection chart along with SEMG data from Chart 5 software. The RMS data were considered using a 30-second sliding window after ten minutes of typing was complete. In order to normalize the data, all values were expressed as % MVC (Maximal Voluntary Contraction).³⁴

Recording the MVC: The RMS value of the SEMG response was recorded during maximum voluntary isometric contraction of the middle and lower trapezius muscles separately. For MT, the participant was positioned prone lying, the recording arm was 90° abducted and externally rotated, and the subject was asked to push his/her elbow upwards against resistance applied by the therapist just proximal to the elbow. The participants performed three or more isometric maximal voluntary contractions (MVC's) until a consistent response was obtained. The highest SEMG response was recorded. The procedure remained the same for LT except that the arm abduction component was increased to 120°.¹⁶

DATA ANALYSIS

Preliminary analysis was done by the Kruskal Wallis test for the demographic data. There were no between-group differences for the age, gender, height, weight, duration of computer use per day, NDI score, typing speed, and frequency of sagittal plane movements of head ($p = 0.3$). Thus, they were not considered in subsequent analyses. Descriptive analysis was done for all the variables. A test of normality was done using Shapiro-Wilk test, which revealed data were normally distributed ($p > 0.05$). Hence, a parametric test was used for interval/ratio data. A paired t-test was used to see differences occurring pre and post intervention in each of the neck pain groups. A one-way ANOVA was done to determine differences between the groups at rest and during first and second typing tasks. A post hoc analyses with Bonferroni correction was conducted to control type 1 errors.

Data were analyzed using SPSS windows version 16. Statistical significance was set at $p < 0.05$ with 95% confidence interval.

RESULTS

Eighty three participants (39 males and 44 females) were evaluated for the study. However 60 fulfilled the inclusion criteria and were selected (descriptive data presented in Table 1).

Table 1. Descriptive Statistics for the Groups

Variables	Group A N=20	Group B N=20	Group C N=20	P*
Age (yrs) †	25.75 ± 2.24	25.70 ± 1.80	25.75 ± 2.80	0.997
Gender#	Male (22)	7	8	0.933
	Female (38)	13	12	
Height (cm) †	162.15 ± 0.18	163.37 ± 0.19	163.98 ± 0.13	0.471
Weight (kg) †	59.25 ± 7.79	59.20 ± 7.19	62.75 ± 1.05	0.335
Computer Usage (Hrs/ Day) †	4.90 ± 1.02	4.90 ± 1.02	4.80 ± 0.95	0.935
NDI Score (%) ‡	20.92	20.08	NA	0.814
Typing Speed (wpm) ‡	26.95	29.85	34.70	0.360

† Mean (S.D.); ANOVA was done to obtain P value, #Number, ‡ Mean Rank; P value was computed from Kruskal Wallis test

* Statistical significance was set at $P < 0.05$ with 95% confidence interval

At rest, mean MT activity was greater in “pain groups” than the control group, while mean LT activity was similar in all the groups. As typing commenced, activity of both middle and lower trapezius increased in all the groups (Table 2).

Table 2. SEMG Activity at Rest and 1st Typing Task (TT1)

	MIDDLE TRAPEZIUS Mean (S.D.)			LOWER TRAPEZIUS Mean (S.D.)		
	Group A	Group B	Group C	Group A	Group B	Group C
Rest	13.36 (5.65)	13.29 (5.02)	7.67 (2.85)	7.01 (1.94)	6.82 (2.02)	5.86 (1.97)
TT1	15.85 (4.83)	15.44 (4.27)	9.31 (3.08)	13.87 (4.24)	10.08 (2.30)	7.62 (2.33)
T- Test	t	-3.14	-3.886	-2.767	-11.106	-9.910
	P	0.005*	0.001*	0.012*	0.001*	0.001*

*P<0.05

Between the two typing tasks, the activity of the MT remained similar (P = 0.664), while that of LT decreased sharply (P = 0.001) in the control group (Table 3). The pain groups, on the other hand, exhibited a decrease in MT activity (P = 0.001, 0.044) with no significant change in LT activity (P = 0.667, 0.873).

Table 3. SEMG Activity During 1st Typing Task (TT1) and 2nd Typing Task (TT2)

	MIDDLE TRAPEZIUS Mean (S.D.)			LOWER TRAPEZIUS Mean (S.D.)		
	Group A	Group B	Group C	Group A	Group B	Group C
TT1	15.85 (4.83)	15.44 (4.27)	9.31 (3.08)	13.87 (4.24)	10.08 (2.30)	7.62 (2.33)
TT2	11.15 (3.06)	12.97 (3.51)	9.09 (4.19)	13.58 (3.71)	10.02 (2.68)	5.24 (1.25)
T- Test	t	4.25	2.158	0.441	0.437	0.161
	P	0.001*	0.044*	0.664	0.667	0.873

*P<0.05

Mean SEMG recordings from the LT at rest and during typing (6.56±2.01% and 10.07±4.19 %) were found to be less than that of the MT (11.44±5.30 and 12.30±4.66 %) in all the groups.

In the second typing task, the MT Activity (Table 4) differed in Group B and Group C (P = 0.004). However, there was no difference between the Group A (given scapular orientation exercises) and the control group (P = 0.229).

Table 4. SEMG Activity of Middle Trapezius

	Group wise SEMG Mean (S.D.)			One-Way ANOVA		Post-Hoc Analysis P - Value		
	A	B	C	F	P	A-B	B-C	A-C
Rest	13.36 (5.65)	13.29 (5.02)	7.67 (2.85)	9.79	0.001*	1.00	0.001*	0.001*
TT1	15.85 (4.83)	15.44 (4.27)	9.31 (3.08)	15.72	0.001*	1.00	0.001*	0.001*
TT2	11.15 (3.06)	12.97 (3.51)	9.09 (4.19)	5.78	.005*	3.49	0.004*	0.229

*P<0.05

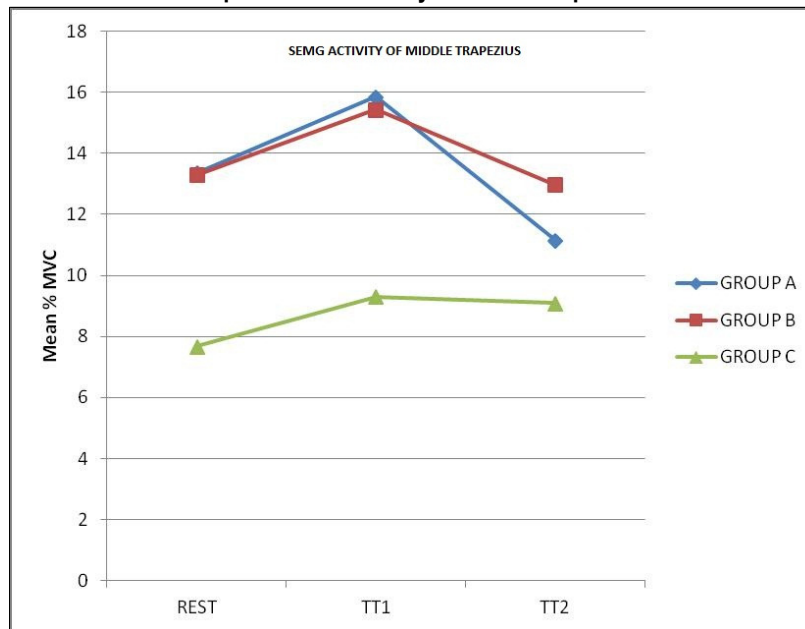
The activity of the LT was significantly different in all the groups during both typing tasks (Table 5).

Table 5. SEMG Activity of Lower Trapezius

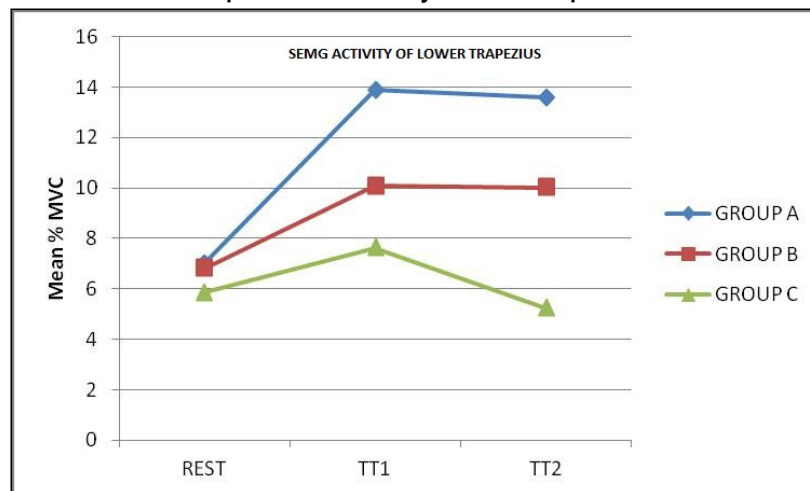
	Group wise SEMG Mean (S.D.)			One-Way ANOVA		Post-Hoc Analysis P - Value		
	A	B	C	F	P	A-B	B-C	A-C
Rest	7.01 (1.94)	6.82 (2.02)	5.86 (1.97)	1.951	0.152	1.00	0.390	0.211
TT1	13.87 (4.24)	10.08 (2.30)	7.62 (2.33)	20.70	0.001*	0.001*	0.044*	0.001*
TT2	13.58 (3.71)	10.02 (2.68)	5.24 (1.25)	46.58	0.001*	0.001*	0.001*	0.001*

*P<0.05

Graph 1. SEMG Activity of Middle Trapezius



Graph 2. SEMG Activity of Lower Trapezius



DISCUSSION

The objective of this study was to compare the effects of a scapular postural correction exercise program and relaxation techniques on the trapezius activity in computer users reporting neck pain. It was found that a scapular posture correction strategy could normalize the muscle activity among individuals with neck pain to a greater extent than relaxation exercises.

Electrical Activity of Muscle at Rest

Between-group analysis for the MT revealed that activity in pain groups was significantly higher than that of control group ($P = 0.001$) (Table 4). There was however, no statistically significant difference in the LT activity of any of the groups ($P = 0.152$) (Table 5). This reflects greater sensitivity of the MT to pain than the LT. Also, change in the resting activity of muscle is indicative of long term pain mechanisms like low-frequency fatigue and neuromuscular changes that operate even after the cessation of task, and is believed to be responsible for neck pain in computer users.^{12, 13, 23} Since chronic pain patients with a history of neck pain greater than 3 months were included in the study, the presence of taut bands (tense muscle fibers) in these muscles could be a reason for the increased activity at rest.³⁵⁻³⁸

Muscle Activation Patterns

During the first 5-minute typing task, TT1, activity increased in both middle and lower portions of the trapezius in control group as well as pain group participants ($P < 0.05$) (Table 2), reflecting how promptly the muscle comes into action as soon as typing is commenced. This is in accordance with the findings of previous studies and has been accepted with little ambiguity.^{23, 39} The magnitude of increment (percentage increase) was less marked in the “pain group” patients. This reflects a greater capacity of normal muscle to change the activation levels according to the functional demands.

Some authors have found that the interpretation of neck proprioceptive signals in individuals with recurrent neck pain was markedly altered, resulting in decreased capacity to switch between reference frames.⁴⁰ An association between the cervico-cephalic kinesthetic sensibility and frequency of neck pain has also been reported.⁴¹

Effect of Scapular Posture Correction Strategy

The activity exhibited by Group C participants or pain-free controls was considered to be “normal” and was used as a reference standard for the other groups. Activity in the MT remained unchanged while a significant decrease in activity of the LT was seen in this group (Table 3,) reflecting that in asymptomatic individuals, the work load is gradually withdrawn from LT. This indicates the body’s innate tendency to recruit neck muscles with prolonged work.¹¹

A reverse trend was observed in the “pain” groups during the second typing task. In both of these groups, the MT activity decreased significantly ($P = 0.001, 0.044$) while the LT activity remained the same ($P = 0.667, 0.873$) (Table 3). It is proposed that in group A participants, regaining of postural acuity, which is one mechanism by which these exercises work, helped in bringing down the electrical activity of the MT closer to the control group ($P = 0.229$).⁴ Possibly normal proprioception facilitated optimal recruitment of the MT without the stress on neck muscles (which would not allow over load also due to pain) as reflected by constancy in recruitment of the LT, unlike the control group. The optimal recruitment of the MT after performing posture correction exercises can also be a result of the dynamic nature of exercises. The relaxation followed by contraction in such a mode of exercise ensures simultaneous replenishment, although partial, of free hydrogen ions from blood buffers to neutralize the lactate accumulated in muscle after static contraction, maintain the optimum pH, and delay the onset of fatigue, if any. The decompression of mechanically loaded tissues may have occurred as well when the patient changed positions to perform these exercises. This can be another positive beneficial factor in this group. Such mechanisms also have an instrumental role to play in pain reduction in the long run.

The reduction in muscle activity seen in group B participants seems to have occurred as a result of central inhibition pathways. But the percentage reduction in mean electrical activity was observed to be more marked in group A than group B, pointing towards greater efficacy of the intervention given in group A compared to group B.

No significant difference between the mean activity of the LT muscle before and after intervention (Table 3) in both “pain” groups could also be attributed to lesser sensitivity of this muscle to mechanical changes and greater innervation of this muscle by high threshold, larger sized α - motor neurons, which are late to excite and late to relax.²³ But since the recording was done after 10 minutes, this theory can hardly be accepted.

It may be concluded from this study that posture correction exercises may have a greater role in altering the trapezius activity than relaxation techniques in computer users having neck pain.

Since exercises were few and instructions were simplified, understanding the exercises was not cumbersome for the participants, and none denied abiding by the protocol. Also, since untrained computer users (not having prior formal training in typing) were considered in the study, and compensatory mechanisms were quick to set in, it was not difficult to compare the muscle activities. However, difficulty did arise in simultaneous checking of sagittal and coronal plane alignment of the scapula during the second typing task because only one evaluator was present for recording. Therefore only sagittal plane deviations were checked and reinforced by verbal cues, as it was learnt from previous literature and prevalence in our study population that deviations in the sagittal plane form a majority of all postural alterations for cervico-brachial region.

There were some limitations in the study that should be considered while drawing inferences from the results. Firstly, the age group taken in this study was limited according to the availability of subjects, and therefore the results can be generalized only to similar groups. Nevertheless, this study represents a major population prone to developing chronic neck pain. Hence, data so obtained can be used as a reference for prospective studies. Secondly, SEMG graphs were being displayed in the background of the same screen on which the participants were typing; therefore, the effect of biofeedback may have occurred with participants trying to manipulate the graphs and hence the muscle activity. Thirdly, visual acuity was not recorded, which has been mentioned as a major risk factor for neck pain in the past. This may have affected the results. Maintenance of coronal plane alignment was not checked while typing because of the presence of only one evaluator, which may have caused discrepancies in the SEMG recordings. Further, the possibility of cross talk between different fibers of trapezius affecting the SEMG recording cannot be negated. Finally, errors in electrode placement and measurement of scapular deviation and forward head translation are likely to have influenced the results.

This study only checked the immediate effects of exercise. Further studies are needed to determine whether a standard period of training (say 3 weeks) can influence pain, function and activity of the trapezius muscle at rest/during typing.

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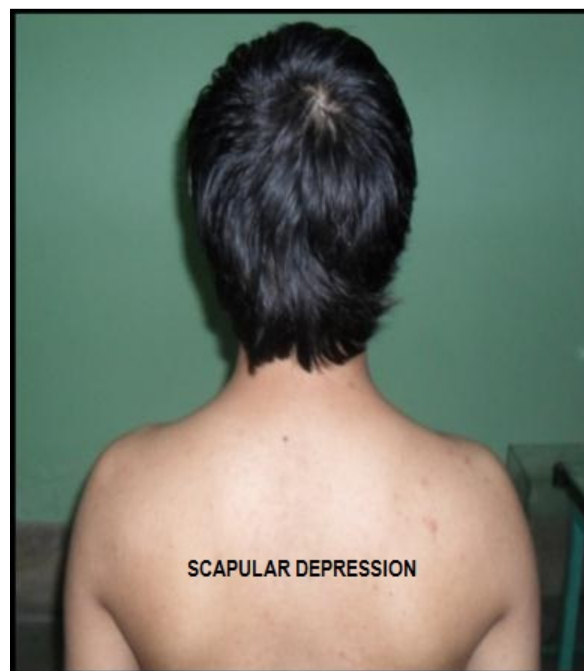
KEY TERMS

Neck-pain, Computer-user, Posture, Ergonomics

Appendix A Exercise Interventions

Instructions to participants: Assume a neutral lumbar spine; and position the scapula correctly on the chest wall in the mid-position of all directions of scapular motion, as instructed.

1. Shrug your shoulders by trying to touch the shoulders to the ears and bring them down as much as you can.



2. Gently spread the front of your shoulders apart to draw your shoulder blades across your chest wall and then bring the tip of both your shoulders forwards as in trying to touch each forwards.



3. Gently lift the tip of the shoulder and drop it as much as you can.



Appendix B

A. ERGONOMIC ADVICE HAND-OUT

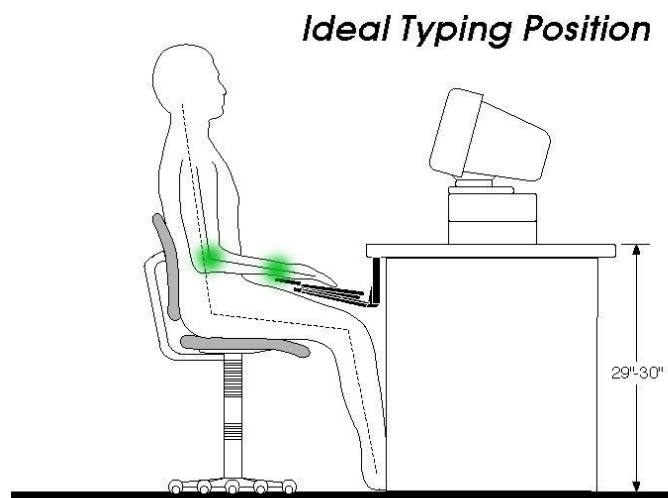
Take care of the following considerations for an ideal workstation.

Use a good chair with a dynamic chair back and sit back in this. Use a document holder, preferably in-line with the computer screen. Use a stable work surface and stable (no bounce) keyboard tray. Center monitor and keyboard in front of you. With your back against the back of your chair, place the monitor at an arm's length away from you (distance from shoulder to fingertip while keeping your arm straight). Position the monitor at a comfortable eye level, which is about 2" to 3" below the top of the monitor casing (with monitor in upright alignment). It helps prevent eye strain and tendency to lean forward. If you wear bifocals or progressive lens make sure that you sit back in your chair to view the screen. Avoid looking forward to look at the screen, use the keyboard, and move the mouse to zoom in the view. There should be no glare on screen, use an optical glass anti-glare filter where needed.

Adjust the height of your chair to use the keyboard and mouse properly. This encourages good posture and avoids pressure on the back of your thighs. Adjust your chair to sit in a reclined position, lean back slightly from an upright position. Keep your back naturally curved. Support your lower back with a lumbar support (a cushion or a pad). This increases comfort, decreases lumbar disc pressure, relaxes back muscles and minimizes pressure on the vertebrae. Have some space between the undersides of your knees and the seat of your chair. It helps prevent occlusion of circulation and nerve compression at the back of knees. Keep your feet flat on the floor or footrest. Do not tuck your feet under your chair. It increases tension at knee and ankle joints. Sit on a padded seat or a cushion. The sit bones remain supported and the weight is distributed evenly.

For typing, position the keyboard so that your forearms are parallel to your thighs when your feet are flat on the floor or use a keyboard tray that tilts downward when feet rest on the footrest (though the latter is better). It helps to maintain blood flow in the hands. Do not rest your elbow or lean your forearm on a chair armrest while you are typing. It creates pressure points, compresses finger flexor muscles and ulnar nerve at elbow. Arm rests should be used when not typing or using mouse. Keep your elbow close to your body and allow your arm to relax while you use the mouse. Do not overuse the scroll wheel. It may damage flexor tendons. Use the mouse with your elbow as a pivot point. Keep wrist straight. Do not use a mouse that forces you to bend your wrist. Do not use a wrist rest. It may cause median nerve compression at wrist.

Remember to blink frequently and periodically look away from the computer screen (eye breaks every 15-20 minutes). Take frequent short breaks (micro breaks every 1-2 minutes) to rest the hands in a relaxed, flat, straight posture. Take rest breaks every 30-60 minutes in which you move around and do something else. Take exercise breaks every 1-2 hours in which you do stretching and gentle exercises to relieve muscle fatigue. Use ergonomic software that prompts you to take breaks at regular intervals.



B. HOME EXERCISE PROGRAM

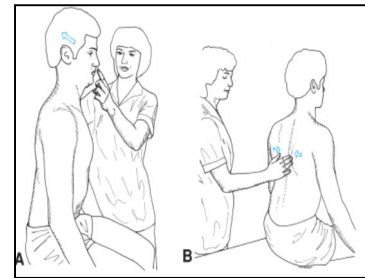
Posture correction exercises-

A. Cervical Retraction exercise

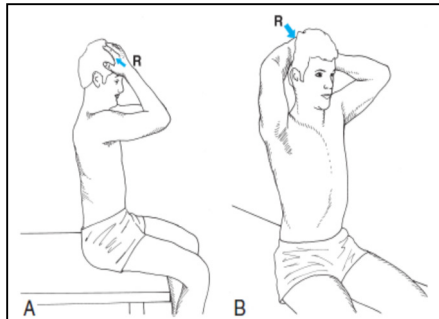
Patient position and procedure: Sitting or standing, with arms relaxed at the side. Lightly touch above the lip under the nose and lift the head up and away from it. Tuck the chin in and straighten the spine. Move to the extreme of the correct posture and then return.

B. Scapular Retraction exercise

Patient position and procedure: Sitting or standing. Bring your shoulder blades towards the midline and pinch them together (retraction). Imagine “holding a quarter between the shoulder blades”. Do not extend the shoulders or elevate the scapulae.



Strengthening of neck muscles-



A. Flexion. Place both hands on the forehead and press the forehead into the palms in a nodding fashion while not allowing motion.

B. Extension. Similarly press the back of the head into both hands, which are placed at the back of the head.

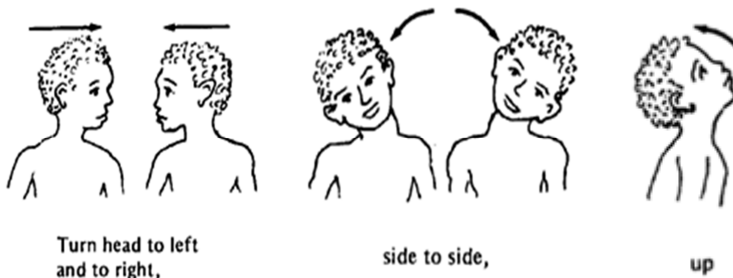
C. Side bending. Press one hand against the side of the head and attempt to side-bend, as if trying to bring the ear toward the shoulder but not allowing motion.

D. Rotation. Press one hand against the region just superior & lateral to the eye and attempt to turn the head to look over the shoulder but not allowing motion.

Neck mobility exercise-

Patient position: Sitting

Procedure: Move your neck in all the directions as shown in the pictures.



Shoulder girdle exercise-

Patient position: Sitting

Procedure: Move your shoulder blade in all the directions as shown in the pictures.

