



ISSN Print: 2394-7500
ISSN Online: 2394-5869
Impact Factor: 8.4
IJAR 2021; 7(12): 293-300
www.allresearchjournal.com
Received: 23-09-2021
Accepted: 11-11-2021

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Effectiveness of sternocleidomastoid and suboccipital muscle stretch for neck pain among smart phone users: A comparative study

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Abstract

Neck pain is a common problem in the general population. The source of pain may arise from many structure of the cervical spine, and can develop into chronic pain. Neck problems can adversely affect physical, psychological, and social function. Neck pain also leads to high costs in national healthcare systems. The prevalence of neck pain was reported to range from 22% to 30% of the population. It is considered one of the most common pain problems. The number of smart phone users has increased dramatically. Poor posture while looking at the visual display terminals of smart phones for extended periods causes musculoskeletal problems. Prolong smart phone use causes continued mechanical stress on the tendons, muscles, and surrounding tissues, and furthermore maintaining the same posture can also be cause musculoskeletal disorder. Stretching exercise is our treatment of interest because it can decrease muscle stiffness by elongating the elastic component of the musculo tendinous unit. It can also decrease pain and improve flexibility. Our interest is stretching exercise, owing to its effect in decreasing muscle stiffness and improving flexibility. In this Study, the effect of SCM St and the effect of SOM St were compared. The neck pain caused due to prolong usage of Smart phone will be applied with treatment of SCM St and SOM St. This study includes 30 samples from the age group between 23 – 34 the person having neck pain due to prolong usage of smartphones are divided into two groups Group A (SCM St), Group B (SOM St) treatment was given for 2 weeks and outcomes were measured by NPRS and NDI during pre and post treatment. Results shows that there is an significance decrease in the pain and improvement in flexibility after SCM St.

Keywords: Neck pain, Sternocleidomastoid muscle stretch, Sub occipital muscle stretch, Smartphone users

Abbreviations: SCM St-Strenocleidomastoid Muscle Stretch, SOM St-suboccipital Muscle Stretch, NPRS-Numerial Pain Rating Scale, NDI-Neck Disability Index

Introduction

Neck pain is a common problem in the general population. The source of pain may arise from many structure of the cervical spine, and can develop into chronic pain [23]. Neck problems can adversely affect physical, psychological, and social function. Neck pain also leads to high costs in national healthcare systems [36]. Studies have demonstrated altered behavior of the cervical muscles in neck pain. The prevalence of neck pain was reported to range from 22% to 30% of the population. It is considered one of the most common pain problems [29, 30].

The number of smart phone users has increased dramatically. Poor posture while looking at the visual display terminals of smart phones for extended periods causes musculoskeletal problems. Straker *et al.*, reported that the visual display terminal of a tablet PC, which has a smaller screen than that of a regular desktop computer, requires the user to bend his/her neck more, thereby increasing the activity of the shoulder muscles. The angle at which someone looks at a visual display terminal with a small screen is lower than that of a big screen. As a result, the person has to bend his/ her neck a lot more [9]. Using a smart phone while adopting a poor posture can cause various physical problems. The neck and shoulders are particularly vulnerable to pain due to smart phone use, with the muscles showing a high level of muscle fatigue, resulting in exhaustion and pain [9].

Prolong smart phone use causes continued mechanical stress on the tendons, muscles, and surrounding tissues, and furthermore maintaining the same posture can also be cause musculoskeletal disorder [1]. When the height was low, The neck was more flexed, and it produced significantly higher neck extensor muscle activities [13]. In addition, looking down at your smart phone too much can lead to upper back pain ranging from chronic, nagging pain to sharp and severe pain [14].

The cervical spine is a continuous and coordinated network of muscles, nerves and joints, the pathway ranging from the brain to the spinal cord. Irritation along this pathway leads to pain. As the dependence of mobile phone is increasing rapidly and people spend long hours on mobile phone which lead to various musculoskeletal problems [17]. The epidemiology of neck pain is important for several reasons. More knowledge about the size and extent of this problem would facilitate accurate predictions of the need for medical services and direct resources [18].

Pain is an unpleasant sensation associated with actual or potential tissue damage.

Stretching is known to be a one of the important component of treatment protocol of neck pain patients. Stretching is a form of physical exercise in which a specific muscle or tendon is deliberately flexed or stretched in order to improve the muscle's felt elasticity and achieve comfortable muscle tone. The result is feeling of increased muscle control, flexibility and range of motion [6]. A number of different stretching exercises can be used to treat the patients with neck pain including dynamic stretching which a patient can practice alone for prophylaxis, proprioceptive neuromuscular facilitation, where the release and contraction of a muscles are repeatedly practiced, and Evjenth-Hamberg stretching, where isometric contraction and static stretching are applied to agonist and antagonist muscles using the hold and relax technique and the contract relax technique [6].

Stretching exercise is our treatment of interest because it can decrease muscle stiffness by elongating the elastic component of the musculo tendinous unit. It can also decrease pain and improve flexibility. Our interest is stretching exercise, owing to its effect in decreasing muscle stiffness and improving flexibility [8]. In this Study, the effect of Sternocleidomastoid muscle stretch and the effect of Sub occipital muscle stretch were compared. The neck pain caused due to prolong usage of Smart phone will be applied with treatment of Sternocleidomastoid muscle stretch and Sub occipital muscle stretch. Thirty patients who had neck pain due to prolong usage of smartphone will be divided into two groups. This two groups are applied with the treatment plan of Sternocleidomastoid muscle stretch and sub occipital muscle stretch for duration of two weeks. The main objective of this study to compare the effectiveness of Sternocleidomastoid muscle stretch and Sub occipital muscle stretch for neck pain patients among smart phone users.

Aim of the Study

The aim of the study is to evaluate the Effects of Sternocleidomastoid Muscle Stretch and Sub Occipital Muscle Stretch for Neck Pain among Smart Phone users.

Objectives of the study

- To evaluate the effectiveness of sternocleidomastoid muscle stretch on neck pain among smartphone users.

- To evaluate the effectiveness of Suboccipital muscle stretch on neck pain among smartphone users.
- To compare the effectiveness of sternocleidomastoid and suboccipital stretch on neck pain among smartphone users.

Need of the study

The need of the Study is to evaluate the effectiveness of Sternocleidomastoid Muscle Stretch and Sub Occipital Muscle Stretch for Neck Pain among Smart Phone users.

Background of the study

Stretching is known to be a one of the important component of treatment protocol of neck pain patients. Stretching is a form of physical exercise in which a specific muscle or tendon is deliberately flexed or stretched in order to improve the muscle's felt elasticity and achieve comfortable muscle tone. The result is feeling of increased muscle control, flexibility and range of motion.

Hypothesis

Null Hypothesis

There is no significant improvement in patients treated with Sub occipital muscle stretch in the treatment of neck pain due to prolong usage of smart phone.

Alternative Hypothesis

There is a significant improvement in patients treated with Sternocleidomastoid muscle stretch in the treatment of neck pain due to prolong usage of smart phone

Review of literature

1. Gidey gomera weleslassie *et al.*, (2020): This study concluded that the nearly half of the study participants self reported to have suffered neck pain, physical exercise, duration of reading and awkward neck posture are likely to be significantly associated neck pain among the medical students and this shows the evidence for neck pain is increasingly becoming a health problem
2. Ahmad H *et al.*, (2020): The purpose of the compare efficacy of combination therapis on neck pain and muscle tenderness in male patients with upper trapezius active myofascial triiger pointsand this study shows the evidence of age group that 19-38 years adults had mechanical neck pain and its also for providing stretching and strengthening exercises for individuals with neck pain.
3. Thavatchai suvarnnato *et al.*, (2019): The purpose of their study was that compare and evaluate the importance of specific deep cervical muscle exercise in neck pain, neck muscle strength, craniocervical angle in randomized controlled trial and the study had 54 individuals with chronic neck pain randomly allocated to 3 groups; extensor training, flexor training, or control group were trained for 6 weeks and 2 training group shows better result than control group, it shows evidence for importance of specific cervical muscles on neck pain.
4. Seong Joong Kim *et al.*, (2018); The study stated that applying Soft tissue release intervention to smartphone users aged 23 to 34 who had latent Muscle Trigger Point in the upper trapezius muscle resulted in decreased muscle hardness and increased in Pressure

Pain Threshold in the Sternocleidomastoid muscle and Upper Trapezius muscle.

5. Jaana h suni *et al.*, (2017): Their aim of the study was to examine the effectiveness of standardized exercise program for reducing pain and improving fitness in office workers with recurrent non-specific neck pain and LBA. Study was conducted among randomized 34 commercial fitness clubs and shows that exercise program was effective for reducing pain and local strain in the neck area but not reducing pain and strain in low back area and this study gave evidence for inclusion and exclusion criteria.
6. Vijay Kage, Pavan Joshi *et al.*, (2017): This study stated that immediate effect triplanar myofascial release and suboccipital release were effective in terms of reducing functional disabilities pain and tender point however the suboccipital group showed more significant improvement
7. Amr almazabdel aziem *et al.*, (2014): Their aim of the study was investigate the efficacy of deep neck flexor exercises in the management of neck pain. Study had 60 patients divided into 3 groups. Modalities including TENS, Ultrasound, and IRR, for group-1, modalities + isometric, stretching, scapulothoracic exercises for group-2, modalities+deep cervical muscles exercises for group-3 were trained for 6 weekend of the study shows much results in deep cervical exercises and thus shows evidence for exercise protocol.
8. Wim jorritsma *et al.*, (2012): In their study they compare the validity of neck pain and disability *scale and neck* disability index. This study was conduct over 2-9 weeks, outcomes used but prior to the start of the rehabilitation program and also end of the program and from this they concluded that the neck disability index shows much validity than the neck pain and disability scale. This study gave the evidence that neck disability index shows validity comparing neck pain and scale.
9. Emilly R. Howell *et al.*, (2011): The association between neck pain, the neck disability index and cervical range of motion the study shows the need for further research to explore the association between the NDI neck pain and cervical range of motion.
10. L.M.Straker, J.Coleman *et al.*, (2008) [5]: The study stated that compared with desktop computer, tablet computer use by young children is associated with more flexed and asymmetrical trunk and more flexed and elevated shoulders and greater muscle activity around the neck.
11. Jari Ylinen *et al.*, (2007) [19]: The study stated that Both stretching exercise and manual therapy considerably decreased neck pain and disability in women with non-specific neck pain. The difference in effectiveness between the 2 treatments was minor. Low-cost stretching exercises can be recommended in the first instance as an appropriate therapy intervention to relieve pain, at least in the short-term.

Methodology

Study Design: Experimental Study

Study Type: Comparative Study

Study Duration: 2 Weeks

Study Setting: Aarupadai Veedu Medical College & Hospital, Kirumampakkam, Puducherry.

Sample Size: 30 Samples

Sample Method: Random Sampling

Inclusion Criteria

- Age Group Between 23 – 34 years
- Both Gender (Male and Female)
- Person having neck pain
- History of neck pain due to prolong usage of smart phone

Exclusion Criteria

- Recent surgery around neck and shoulder
- Fracture around Shoulder Joint
- Fracture around Neck Region
- Recent injury around neck and shoulder region
- Cervical Radiculopathy
- Cervical Myelopathy
- Vertebrobasilar Artery Syndrome

Outcome Measure

- Numerical Pain Rating Scale
- The Numerical Pain Rating Scale is a unidimensional measure of pain intensity measure of pain intensity in adults.
- The scale is a segmented numeric version of the visual analog scale in which a respondent selects a whole number (0-10 integers) that best reflects the intensity of pain.
- The 11 point numerical scale ranges from 0 representing “no pain” to 10 representing “pain extreme” as bad as you imagine.
- High test retest reliability has been observed in both literate and illiterate patients before and after medical consultation.
- For construct validity the NPRS was shown to be highly correlated with the VAS in patients with chronic pain conditions.

Neck Disability Index

- The neck disability index has been designed to give us information as to how the neck pain has affected person’s ability to manage in everyday life.
- The questionnaire consist of 10 sections and for each section the total possible score is 5 and all the 10 questions completed the score is calculated as follows

$$\frac{\text{Total scored}}{\text{Total possible score (50)}} \times 100 = \%$$

Tools Used

- Towel or blanket
- chair
- Questionnaires
- Pen
- Pencil

Procedure

A comparative study design was used for the purpose of the current study. 30 patients were selected based on the inclusion and exclusion criteria and informed consent was taken from them, before starting the study.

Patients were assessed at the 1st day before giving treatment and follow up of the patients were done at the end of the 2nd week after completing the treatments.

Group A: 15 participants, Group B: 15 participants. Both group initially assessed the pain using numerical Pain scale and functional disability level by neck disability index and values are noted [Pre-test]

Group A are treated with sternocleidomastoid stretch and Group B treated with sub occipital stretching daily for 2 weeks.

Group A were trained with Sternocleidomastoid muscle strengthening exercises and Group B were trained with Sub Occipital muscle strengthening exercises.

After 2 weeks of the treatment period both group participants were assessed for pain, disability, post test and Pre-test values of both [group A and group B] are statistically analysed and the results will be interpreted.



Fig 3: Sternocleidomastoid stretch

Group A

Group A was given with the treatment of Sternocleidomastoid Muscle Stretch for duration of two weeks along with stretch the patients are trained with Sternocleidomastoid muscle strengthening exercises for the patients who were suffered from neck pain due to prolong usage of smart phone. The cervical range of motion is examined before the treatment protocol in order to know the cervical range of motion and the treatment should be planned to promote cervical range of motion along with the neck pain. The Numerical Pain Rating Scale (NPRS) and Neck Disability Index (NDI) were used as a outcome measure to know the effectiveness of the treatment. These two outcome measure were noted Pre-test and Post test.

Group B

Group B was given with the treatment of Sub Occipital Muscle Stretch for duration of 2 weeks along with stretch the patients are trained with Sub Occipital muscle strengthening exercise for the patients who were suffered from neck pain due to prolong usage of smartphone. The cervical range of motion is examined before the treatment protocol in order to know the cervical range of motion and the treatment should be planned to promote cervical range of motion along with the neck pain. The Numerical Pain Rating Scale (NPRS) and Neck Disability Index (NDI) were used as a outcome measure to know the effectiveness of the treatment. These two outcome measure were noted Pre-test and Post test.



Fig 4: Suboccipital stretch

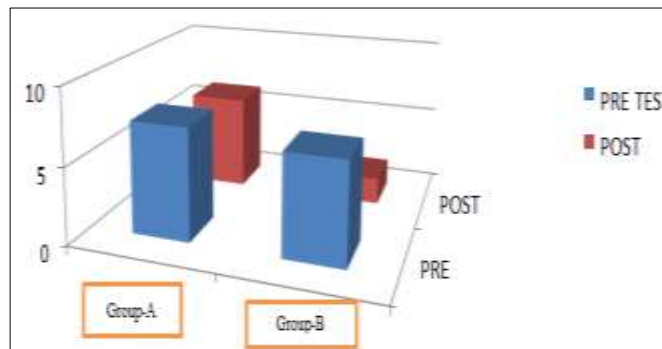
Data Analysis and Interpretations
Numerical Pain Rating Scale

Table 1: Shows the comparison of Group A and B pre and post score numerical pain rating scale

Group	N	Mean		SD		T Value	P Value
		Pre-Test	Post Test	Pre-Test	Post Test		
Group A	15	7.33	6.27	1.11	1.22	9.0252	< 0.0003
Group B	15	6.60	1.73	1.06	0.88	25.3605	< 0.0001

TABLE 1: This table shows that there was no significant difference in Pre-test values of group A(7.33)and group B(6.60) and statistically significant difference in post-test values of the SPADI between Group A and Group B. Both

the groups show significant decreased in the post test means but Group A(6.27) Which has the lower mean value and Group A comparatively higher than Group B.



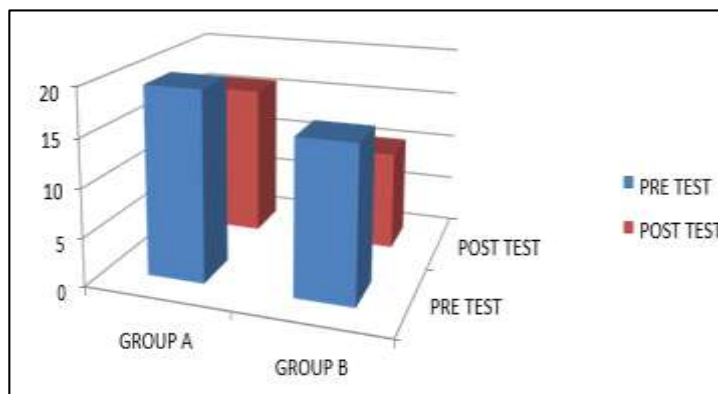
Graph 1: Comparison of Group A and Group B pre and post NPRS

Table 2: Shows the comparison of Group A and B pre and post score Neck Disability Index

NDI	N	Mean		Sd		T Value	P Value
		Pre-Test	Post-Test	Pre-Test	Post-Test		
GROUP A	15	19.60	15.93	5.58	5.0	6.5738	< 0.0001
GROUP B	15	15.93	10.33	4.25	3.64	13.6011	< 0.0001

TABLE 2: This table shows that there was no significant difference in Pre-test values of group A(19.0)and group B(15.93) and statistically significant difference in post-test values of the NDI. between Group A and Group B. Both the

groups show significant decreased in the post test means but Group A(15.93) Which has the lower mean value and Group A comparatively higher than Group B.

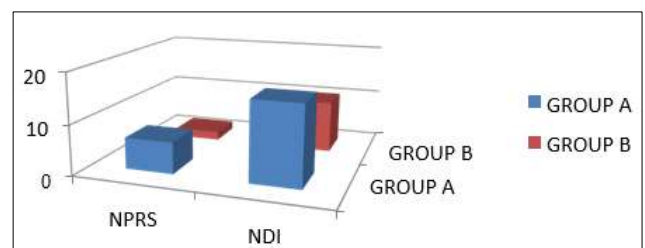


Graph 2: Comparison of Group A and Group B pre and post score NDI

Table 3: Represents the comparison between the results of group A and group B

Outcome Measure	Mean		SD		T Value	P Value
	Group A	Group B	Group A	Group B		
NPRS	6.27	1.73	1.22	0.88	9.1743	< 0.0001
NDI	15.93	10.33	5.60	3.64	2.8556	< 0.0001

TABLE 3: Which shows the comparison value of (NPRS) and (NDI) of Group A and Group B. The Group A mean value of NPRS is found to be 6.27 and NDI is found to be 15.93 and for Group B men value of NPRS is found to be 1.73 and NDI is found t be 10.33. It has been found to that a highly significant difference. $P < 0.0001$ for the group A. Both the groups are statistically significant. But group A mean difference increased much more than group B after the treatment was noticed.



Graph 3: Comparison between the results of Group A and Group B

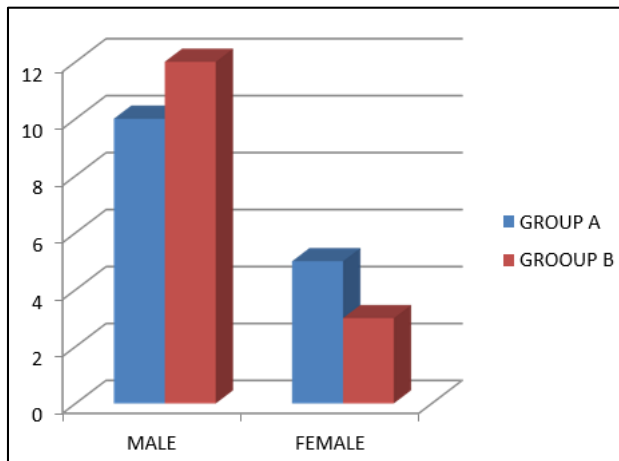


Fig 4: Gender

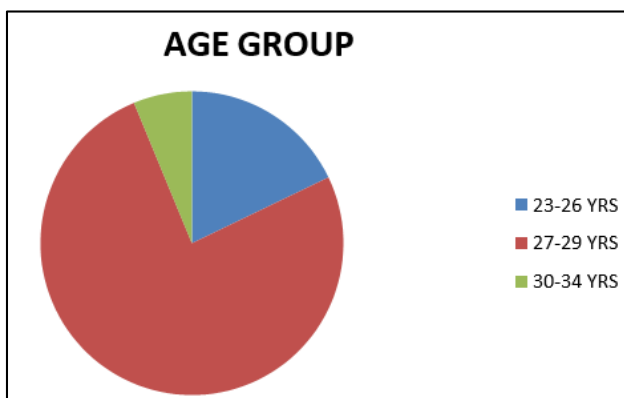


Fig 5: Age Group:

Discussion

Stretching exercise targeting the neck and shoulder areas twice per day, five days per week during this stretching exercise significantly reduced neck exercise and shoulder function.

Stretching exercise five times per week during four weeks was effective for reducing pain in women with chronic neck pain.

The study demonstrated that addiction to smartphone use associated with neck problems and disability among healthy adult subjects. The finding supports high level of computer use related musculoskeletal symptoms around the neck among young college students and that smartphone addiction caused physical health problems and found to be similar one to this study.

Forward head posture is when the neck slants forward placing the hand in front of the shoulders. The most common condition that contributes to neck pain is forward head and shoulder posture. Forward head posture is when the neck slants forward placing the head in front of the shoulders. Prolonged shearing of the vertebrae from forward head posture eventually irritates the small facet joint in the neck as well as the ligaments and soft tissues. This irritation can result in neck pain that radiates to shoulder blades and upper back ^[1].

Thus, based on the results obtained from this study is found to be similar to the another study that it can be concluded that stretching exercises were found to be more effective than strengthening exercises. This could be due to stretching exercises which helped improve the range of motion and also stretch the anterior-tightened structures along with

strengthening of the posterior neck muscles whereas as compared to the strength training which only helped improve the strength and stability of the cervical spine ^[24].

The study results indicate that patients in both groups reported improvement in the health-related quality of life. A possible explanation to this lies in the role of stretching in reducing pain and increasing range of motion, which together may have led to a perceived well-being and thus to the report of an improved quality of life. Positive results in both quality of life and Range of motion generally persisted six weeks after the end of the treatment. At the follow-up, there was a slight worsening in pain compared to the end of treatment and in reported bodily pain, although the differences were not significant. This suggests the need for a continuous exercise program so that patients can maintain the positive results obtained with treatment ^[25].

The results showed that there was a significant increase in craniovertebral angle which reflects the forward head posture in both sitting and standing positions. Such results were similar to the findings in the present study, demonstrating that cranio-cervical flexion exercise improved forward head posture by increasing the craniovertebral angle. The present study performed comparative analysis on the changes in mechanical characteristics of muscles and posture in patients with cervicogenic headache after applying intervention with different exercise programs. The results showed that the group that had cervical stretching and stabilization exercise applied had greater amount of changes in tone, stiffness, and cervical posture. If such points are taken into account when applying exercise therapy to patients with cervicogenic headache, the patients can be maintained more effectively ^[26] and these are similar the current study.

This study proved that the difference in improvement between groups for the Neck disability index was statistically significant, the gap could be of little importance clinically. The neck disability among smartphone users might be related to frequent neck flexion posture which changes the natural curve of the cervical spine and increases the amount of stress on cervical spine leading to irritation and spasm in the surrounding skeletal structures ligaments. In this study the Sternocleidomastoid muscle hardness decreased significantly after Soft tissue release intervention. The results shows that applying the release procedure on the soft tissue of the Sternocleidomastoid muscle reduced vertical height and lengthened the sarcomeres and parallel elastic components which associated with the study.

Conclusion

The results of the study both the Group equally reduce pain and improve range of motion but Group A showed significant changes due to Sternocleidomastoid muscle stretch thereby improving range of motion and reducing pain than Group B. The improvement observed during 2 weeks of the treatment period in both the groups. However significant result were found with the use of 2 weeks protocol there was a significant difference between pre intervention and post intervention values of NPRS and NDI range of motion.

Limitations

- Small sample size
- Study sample was limited between 23to 34 years of age
- Long term effects of treatment were not assessed
- Short study duration

Recommendations

- The sample of this study was small and it can be done on a larger sample
- Long term follow up can be done

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