



Effect of Kinesiotaping with Training Programme on Postural Abnormalities among Touchscreen Smartphone Users

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ABSTRACT

OBJECTIVE:

The objective of the study is to find effect of kinesiotaping with training programme on postural abnormalities among touchscreen smartphone users.

BACKGROUND:

The evolution of technology had a massive impact on human race at every stage of social development. Behavioral addiction such as smartphone addiction is one of them. Forward head posture and forward shoulder posture are most common postural abnormalities seen in chronic smartphone users. Smartphones are becoming increasingly common and have some computer works, and further it has become a culture nowadays. Repetitive movements and poor postures are associated with over-use of smartphone when texting or playing games and significantly contribute to symptoms of pain and discomfort in upper extremities.

METHODOLOGY:

The study is an experimental non-comparative study in which 30 subjects were selected based on selection criteria from Faculty of Physiotherapy, Dr. MGR Educational and Research Institute. Male and female subjects age group between 18 to 25 with less than normal craniovertebral angle and scapular index was included. Any history of traumatic injuries, surgical intervention of neck and upper limb, pregnancy, patient with neurological disorders are excluded from the study. Subjects were taken under convenient sampling method. The study duration 8 weeks. Craniovertebral angle and scapular index was used as an outcome measures. Pre-test and post-test were done using the outcome measures.

PROCEDURE:

30 subjects were selected based on inclusion criteria under convenient sampling method. Pre-test was done using outcome measures which include craniovertebral angle and scapular index. Then the subjects received postural training exercises which includes strengthening and stretching for 8 weeks (5days/week) followed by kinesiotaping over neck and shoulder to provide proper stability and good posture and also ergonomic advice while using smartphone.

RESULT:

On comparing both pre-test and post-test within the group on craniovertebral angle and scapular index show significant difference in mean value.

CONCLUSION:

Kinesiotaping with training programme and ergonomic advices were significantly effective in correcting postural abnormalities such as forward head posture and forward shoulder posture in touchscreen smartphone users.

KEYWORDS: Smartphone, forward head posture, forward shoulder posture, craniovertebral angle, scapular index, kinesiotaping, training programme, ergonomics.

INTRODUCTION

Over past couple of decades advancing technology has a revolutionized the world. The evolution of technology had a massive impact on the human race at every stage of social development. Modern world is unimaginable without things such as computers, vehicles and much more. Smartphone is

one of them. Smartphone users globally are estimated to be 1.08 billion. Statistics suggests that the number is going to reach 10 billion in next 5 years⁽¹⁾.

Smartphone is defined as a mobile phone handset with advanced hardware and software capabilities that enable it to perform complex functions similar to those of laptops and computers⁽¹⁾. The frequency and duration of use of mobile phones are increasing and the design characteristics of these phones give rise to concern regarding their impact upon body mechanism⁽²⁾.

Addiction is repeated use of substance or device despite of its negative effects⁽¹⁾. The combination of repetitive movements, poor posture and overuse of mobile phones without taking rest breaks, can cause injury to the nerves, muscles and tendons in fingers, hand, wrist, arm, elbow, shoulder and neck, which if ignored may leads to long term damage⁽²⁾.

Smartphones are becoming increasingly common and have replaced some computer works and further it has become a culture nowadays. Hours of spending on hunched over a smartphone may be damage on person's posture. Several studies suggested the neck pain problems result from poor posture, in term of sustained long term abnormal physiologic load on the neck⁽³⁾.

Texting on smartphone device involve looking down at the device and touching the touchscreen display, which may contribute to poor posture⁽⁴⁾. The body position of smartphone users is often in forward head posture. That position is a condition in which the vertebral bones form a forward curve so that the position of head tends to be in forward position to maintain the balance of the body⁽⁵⁾.

Normal human body displays a relaxing posture of head and shoulder, with chin tucked in, head up and shoulders opened naturally⁽⁶⁾.

Posture is defined as an attitude assumed by the body either with support during muscular inactivity or by means of the coordinated action of many muscles working to maintain stability or to form an essential basis which is being adopted constantly to the movement which is superimposed upon it or as when the line of gravity passes through the external auditory meatus, the bodies of the cervical spine, and the acromion and anterior to the thoracic spine^(1,12).

A good posture is defined as keeping one's ears aligned with the shoulders and having the angel wings or shoulder blades retracted. Person attaining ideal posture put least stress on spinal structures. The common posture adapted by smartphone users is they bend their neck and stare at the mobile screen. This causes postural alteration and leads to neck pain and later cause postural abnormalities⁽¹⁾.

Frequent usage of mobile device resulted in abnormal postures such as forward head posture, rounded or forward shoulder, thoracic kyphosis, which become more and more common for large populations. Those are abnormal posture of human body, including excessive anterior positioning of cervical spine, over bending of thoracic vertebra, increase positive rake of scapula and shoulders turning forward with inward rotation⁽⁶⁾.

Forward head posture (FHP) is also called forward neck posture, scholar's neck, reading neck, forward head posture is characterized by increase in flexion of lower cervical and upper thoracic region, increase extension of occiput on first cervical vertebra and increase extension of upper cervical vertebrae⁽¹⁾. Forward head posture for a long period can cause musculoskeletal disorder, such as upper crossed syndrome and trigger the shortening of the muscles around the atlantooccipital articulation and excessive straining in the muscles around the joints, causing chronic neck pain and also leads to numbness, tingling in arms and hands, muscle spasm, sore and facial pain⁽⁵⁾. It also can be result of injuries like sprains and strains of the neck, weak neck muscles and alters the muscle activity in neck⁽⁸⁾.

The muscles that become tight and facilitated are pectorals, upper trapezius, levator scapulae, sternocleidomastoid, sub occipitals, subscapularis, latissimus dorsi and arm flexors. The muscles that become weak and inhibited are longus capitis, longus colli, hyoids, serratus anterior, rhomboids, lower trapezius, posterior rotator cuff and arm extensors. When the pressure on the neck and shoulder is present, the neck and shoulders have to carry the added weight all day in an isometric contraction⁽⁸⁾.

Subjects with FHP shows changes in cervical range of motion and subjects usually presents with tight pectoralis minor muscle. Pectoralis minor muscle is said to be the king of compensation, it's the first muscle to go under tightness in subjects with FHP⁽⁷⁾.

Craniovertebral angle (CVA) is used to assess the forward head posture. CVA is an angle formed by the horizontal line passing through C7 vertebra and a line extending from tragus of the ear to C7. More the use of smartphone with improper posture less is the craniovertebral angle, normal value reported of CVA is more than 50 degree. Angle lesser than 50 degree is considered to be forward head posture⁽¹⁾.

Another most common postural deviation seen in heavy smartphone users is rounded or forward shoulder (FSP). It is defined as abduction and elevation of scapula and forward position of the shoulders, giving an appearance of hollow chest⁽¹⁾. Rounded shoulder is a protrusion of acromion of the shoulder joint relative to the centerline of gravity of the body, causing stooped posture along with elevation, protraction and downward rotation of scapula and an increase angle between the lower neck bone and upper spine⁽⁹⁾.

The repetitive activities constantly overwork and cause a tightening of the pectoralis minor, sternocleidomastoid, and upper trapezius which may cause FSP⁽¹⁰⁾. The pectoralis minor muscle which aids in anterior tilting of scapula gets shortened in FSP which alter normal scapular kinematics⁽¹¹⁾. The tight anterior chest muscles and a weakened posterior thoracic muscle lead to FSP as the glenohumeral joint shifts anteriorly. The anterior shift in the glenohumeral joint also occurs with the scapula, distorting the scapulohumeral rhythm⁽¹⁰⁾.

Scapular index (SI) is an important assessment tool use to assess rounded or forward shoulder. SI is calculated by measuring the distance from mid-point of sternal notch to the medial aspect of the coracoid process and horizontal distance from the posterolateral angle of the acromion to the corresponding thoracic vertebra and multiplying it with 100 ⁽¹⁾.

The recommended treatment for forward head posture and forward shoulder posture has typically involve exercises that focus on the strengthening of weak or inactive muscles and stretching for tight or overactive muscles ⁽¹⁰⁾. And ergonomic advices are necessary in order to reduce further stress on spine. This may reduce severity of their neck and pain symptoms and produce positive effects on mental and physical health ⁽¹⁾.

Among this, kinesiotaping is a therapeutic modality that corrects and treats many musculoskeletal disorders and is based on natural healing process. Kenzo Kase, the creator of kinesiotape, proposed the mechanisms for the effects of kinesiotape which includes altered muscle function by the tape, effects on weakened muscles, improved circulation of blood and lymph by eliminating tissue fluid or bleeding beneath the skin, decrease pain through neurological suppression, repositioning of subluxed joints by relieving abnormal muscle tension ⁽⁸⁾. Its elastic quality helps to support or inhibit muscle function and proprioceptive system which helps in adjusting misalignment of structures and correcting postural abnormalities ⁽¹¹⁾.

REVIEW OF LITERATURE

Mrudula Ganesh Shete et al., (2019) concluded that postural correction exercises and ergonomic advices were significantly effective in correcting postural abnormalities such as forward head posture and forward shoulder posture in chronic smartphone users.

Arti Kumkumwar et al., (2019) concluded that neck retraction taping provides an alternative way for correction of postural malalignment and musculoskeletal dysfunctions such as rounded shoulder posture by using kinesiotape as an initiator to stimulate proper postural control.

Ravija Garud et al., (2019) concluded that there was significant correlation between ergonomic risks and upper extremity musculoskeletal disorders among smartphone users.

Dr. Sakshi Sadhu et al., (2019) concluded that even with the application of 3 days of kinesiotaping in forward head posture in e gaming players which is the most common population to have this kind of deformity is showing improvement in their range of motion particularly the cervical range of motion. There was also slight improvement in shoulder range of motion also.

Nanda Putra Wiguna et al., (2019) concluded that ignorance of how to sort and choose the effects of globalization, especially smartphone use, which can lead to posture disorders. The factor recognized factor for the occurrences of the forward head posture the lack of education about ergonomic positions when using smartphone. Parents are advised to set the right smartphone usage for children as early as possible. And also provides education to minimize forward head posture to children who have been indicated with FHP by doing chin tuck exercise, and by educating about ergonomic position when using a smartphone.

Pattanasin Areeudomwong et al., (2018) concluded that shoulder taping reduces neck discomfort but does not affect neck muscle activity and fatigue while texting on a touchscreen smartphone.

Marina N Samaan et al., (2018) concluded that prolonged use of smartphone more than four hours per day can affect the cervical region causing forward head position, neck pain due to neck muscles spasm and reduce conduction velocity of ulnar nerve due to prolonged cervical flexion.

Zahra Abdollahzade et al., (2017) concluded that four-week intervention protocol successfully improved postural alignment related to forward head posture, therefore 4 weeks stretching and strengthening exercises seems enough for correcting FHP and improving neck muscle strength.

Luke Klawiter et al., (2017) concluded that both groups improved pre/post-test for CVA and in addition there was a moderate inverse relationship between cellphone/computer use and forward head and rounded shoulder posture and scapular dyskinesis.

Yash Kumar K Agrawal et al., (2017) concluded that deep neck flexor activation is suitable to treat neck pain in smartphone addicted people in reducing pain, reducing the disability. Ultimately, it might be feasible to include this intervention to the management protocols for neck pain in frequent smartphone users.

Do Youn Lee et al., (2017) concluded that all interventions increase the CVA and the RSP measurements through 2- week chest muscle exercises and expected that the applied stretching intervention would play a major role in treating forward head posture and rounded shoulder posture.

Na Kyung Lee et al., (2017) concluded that proper exercise could be a good method of improving the cervical angle and respiratory function in smartphone users.

Ilayaraja Alagiathiruveenkadam et al., (2017) concluded that after 4 weeks of treatment program, considerably increase cervical range of motion and reduce neck pain among smartphone users. These reasonable treatment programs (stretching and postural modification) can be recommended for the first instance as an applicable therapy intervention to prevent neck stiffness and to relieve neck pain at least in short term.

Hye-Young Kim et al., (2016) concluded that the effect of stretching and stabilization exercises can reduce muscle fatigue in mobile phone users.

Seong-Yeol Kim et al., (2016) concluded that pain and fatigue worsened with longer smartphone use. Correct posture and break of at least 20 minutes are recommend when using smartphones.

Pin Lv et al., (2016) concluded that long time lowering head and/or using devices could induce rounded shoulder, thoracic kyphosis and FHP, which is due to imbalanced kinematics of cervical muscles, thoracic muscles and upper back muscles. Underloaded resistive exercises and stretching of thoracic muscles could re-balance muscle force, restore muscle elasticity, remove tension and spasm and recover mobility of cervical vertebra and shoulder joints, and effectively improve the symptoms of rounded shoulder, thoracic kyphosis and FHP.

Abeer Ahmed Abdelhameed et al., (2016) concluded that exercise training, postural correction, and instruction on the proper handling of touchscreen smartphone reduce the upper extremity disability and symptoms and improved the hand grip strength and key pinch strength. Therefore, exercise training and ergonomic guidelines concerning the use of touchscreen smartphone will reduce the risk of developing upper extremity musculoskeletal disorders.

Yong-Soo Kong et al., (2016) concluded that the modified cervical exercise was performed for only a relatively short duration, four weeks the exercise brought about an improvement in the forward head posture that was induced by using a smartphone.

Rodrigo Miguel Ruivo et al., (2016) concluded that 16 weeks resistance and stretching training program decreased forward head and protracted shoulder postures.

Vijay Kage et al., (2016) concluded that the comparison of McKenzie neck exercises and deep neck flexor strengthening exercises revealed no statistically significant differences, however each group showed improvement in cervical range of motion and forward neck posture with increase in the pectoralis minor flexibility.

Peeyoosha Gurudut et al., (2016) concluded that kinesiotaping appears to be effective in improving forward head posture. But when compared with placebo kinesiotaping, it did not prove to be superior in treating forward head posture.

Sang IN Jung et al., (2015) concluded that prolonged use of smartphones could negatively affect both, posture and respiratory function.

R.M. Ruivo et al., (2015) concluded that the exercise intervention was successful at decreasing forward head and protracted shoulder. The postural training and rehabilitation performed during physical education classes, with the aim of preventing and managing upper quadrant musculoskeletal pain.

Arghavan Hajibashi et al., (2014) concluded that scapular kinesiotaping along with pectoralis minor stretching exercise improved rounded shoulder posture. Kinesiotape is suggested as a complementary treatment with immediate effects on postural correction of rounded shoulder.

AIM OF THE STUDY

The aim of the study is to find effect of kinesiotaping with training programme on postural abnormalities among touchscreen smartphone users.

NEED OF THE STUDY

The body position of smartphone users is often in forward head posture in which the vertebral bones form a forward curve and also most common postural deviation is rounded or forward shoulder posture, is a protrusion of acromion of the shoulder joint relative to the centerline of gravity of the body. Craniovertebral angle less than 50 degree is considered to be forward head posture and scapular index less than 52 is considered to be forward or rounded shoulder. The purpose of the study is to increase the craniovertebral angle and scapular index by treatment which involve exercise that focus on strengthening of weak or inactive muscles and stretching for tight or overactive muscles and kinesiotaping over neck and shoulder with ergonomic advices while using smartphone.

HYPOTHESES

4.1 NULL HYPOTHESIS

There is no significant difference in effect of kinesiotaping with training programme on postural abnormalities among touchscreen smartphone users.

4.1 ALTERNATE HYPOTHESIS

There is significant difference in effect of kinesiotaping with training programme on postural abnormalities among touchscreen smartphone users.

METHODOLOGY

5.1 STUDY DESIGN: Experimental study

5.2 STUDY TYPE: Non-comparative type

5.3 STUDY SETTING: Faculty of Physiotherapy, Dr. MGR Educational and Research Institute.

5.4 SAMPLE SIZE: 30 Subjects.

5.5 STUDY SAMPLING METHOD: Convenient sampling method.

5.6 STUDY DURATION: 2 months.

5.7 TREATMENT DURATION: 8 weeks (5 days/week)

5.8 INCLUSION CRITERIA:

- Both male and female
- Age group (18-25)
- Forward head posture
- Rounded or forward shoulder posture

5.9 EXCLUSION CRITERIA:

- History of traumatic injuries
- Surgical intervention of neck and upper limbs
- Neurological disorder
- Pregnancy
- Connective tissue disorder
- Rheumatoid arthritis

5.10 OUTCOME MEASURE:

Craniovertebral angle:

Craniovertebral angle (CVA) is used to assess the forward head posture.

CVA is an angle formed by the horizontal line passing through C₇ vertebra and a line extending from tragus of the ear to C₇. The normal value reported to be more than 50°. Angle lesser than 50° is considered to be forward head posture.

Scapular index:

Scapular index (SI) is used to assess the rounded or forward shoulder posture. SI is calculated by the distance from mid-point of sternal notch to the medial aspect of the coracoid process and horizontal distance from the posterolateral angle of the acromion to the corresponding thoracic vertebra and multiplying it with 100. The normal value is reported to be more than 52° and angle less than this value is considered to be rounded shoulder posture.

5.11 MATERIAL USED:

Couch, Kinesiotape, TheraBand, Pillows

5.12 PROCEDURE:

30 subjects were selected based on selection criteria under convenient sampling method. Pre-test was done using craniovertebral angle for forward head posture and scapular index for forward shoulder posture. And subjects less than normal craniovertebral angle and scapular index were selected. History of traumatic injuries and any surgical intervention of neck and upper limbs, any neurological or connective tissue disorder as well as sensory deficits and chronic disease such as rheumatoid arthritis and osteoarthritis and pregnant women were excluded. Patient consent was obtained by explaining the project and treatment procedure. The study was undergone in Faculty of Physiotherapy, Dr. MGR Educational and Research Institute.

Craniovertebral angle (CVA) and scapular index (SI) was used as outcome measures. For measuring the angle, the participants were asked to stand and maintain their usual upright posture with arms resting at the side, and looking straight ahead. For forward head posture lateral view photograph was clicked using digitized camera, by arranging the camera on a tripod, 60cm farther from the left side of the subject. Tragus of the ear was marked, and a black pointer was placed on the skin overlying the C₇ vertebra. The angle was calculated between the horizontal line passing from C₇ and line extending from the tragus of the ear to C₇. If this angle is less than 50 degrees, it is FHP. For forward shoulder posture scapular index was used. Coracoid process and sternal notch were palpated and marked anteriorly, whereas the posterior boundary of acromion process and adjacent thoracic vertebral spine were palpated and marked, the distance between these points were measured with help of measuring tape. The following formula was used to calculate, $SI = (SN \text{ to } CP \times 100) / (PLA \text{ to } TS)$.

Where, SI- scapular index, SN- sternal notch, CP- coracoid process, PLA- posterolateral angle of acromion, and TS- thoracic spine. Pre-test was done using the above mentioned CVA and SI, followed by intervention procedure. Subjects received stretching and strengthening exercise 8 weeks (5 days/week). And kinesiotaping along with ergonomic advices. Post-test was after the cessation of the intervention using the same outcome measures. Statistics was done based on data collection.

ERGONOMIC ADVICES:

- Hold the smartphone near chest level rather than waist level.
- Avoid cradling the phone between ear and shoulder.
- Take breaks and change positions frequently while using phone.
- Hold the phone in one hand and text with other hand, by using thumb and fingers
- Keep the wrists straight when holding and tapping.
- Use protective case that improve grip, which can decrease grip force.
- Choose a smartphone that fits your hand properly.

5.13 INTERVENTION:**➤ STRENGTHENING:**

Chin tuck- the participant is asked to chin tuck in sitting and then in supine with the head in contact with the floor, keep the head straight and hold it for 6 sec and relax. This improve the function of deep flexor muscles such as longus colli, longus capitis and also the trapezius muscle.

Shoulder retraction- this is done in standing position by using TheraBand pulling the shoulders back, they are instructed to retract and pinch scapula together without elevation or extension in the shoulders and hold it for 6 sec and then relax. This will improve function of rhomboids, trapezius and deltoid.

➤ STRETCHING:

Pectoralis stretch- the participant is asked to stand, and hold a piece of wood and place it behind neck while the scapula is pinched and elbows are in 90° flexion until a slight stretch is felt in front of the chest. Hold this for 30 sec and then relax. This stretch the pectoralis and subscapularis muscles.

Neck stretch- done in sitting position and asked to turn the neck to one side and bend towards turned side. Then forward bending with the chin touches the upper chest and also with head slightly rotated bend forward until stretch is felt at back of the neck, hold it for 15 sec each and then relax. This stretch sternocleidomastoid, suboccipital and levator scapulae muscles.

➤ KINESIOTAPPING:

Kinesiotape was applied bilaterally, before application of tape the part was cleaned properly and shaved. Three “I” strip were used.

Done with patient in sitting position with shoulder slight in retraction.

The first “I” strip is placed over the left trapezius area and place the end without any stretch but the middle portion of this strip is maintained in 50% stretch and stick it on to the thorax region and place the end near the lateral side of the chest just up to the level of lower border of scapula.

Then the second strip in same manner on to the right side and the process is repeated.

Then the third strip is used in horizontal way just over those two strips by maintaining the both shoulder positions. The stretch in all “I” strip was used as 50% in the middle and the ends are placed without any stretch.

This taping is kept for 3 days and the patient was assessed again with same outcome measures.

DATA ANALYSIS

The collected data were tabulated and analyzed using both descriptive and inferential statistics. All parameters were assessed using statistical package for social science (SPSS) version 24. Paired t-test was adopted to find the statistical difference within the group.

TABLE-1**COMPARISION OF CRANIOVERTEBRAL ANGLE (CVA) BETWEEN PRE AND POST TEST VALUES**

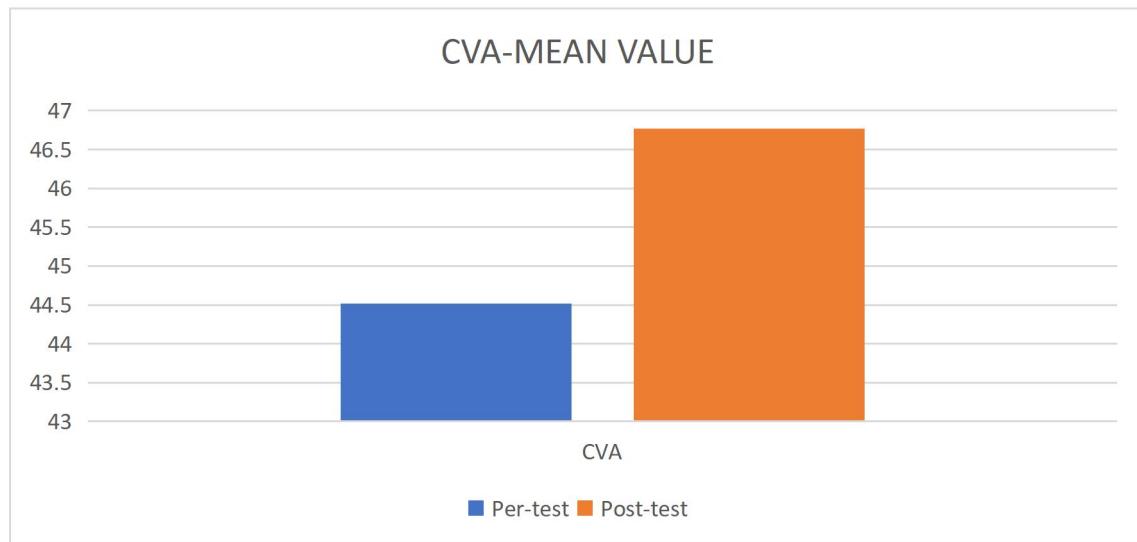
CVA	MEAN	S.D	t-TEST	df	SIGNIFICANE
PRE-TEST	44.52	3.57	-5.286	29	0.000***
POST-TEST	46.77	3.58			

(***-P≤0.005)

The above table reveals the Mean, Standard Deviation (S.D), t-Test, degree of freedom (df), and p-value of the craniovertebral angle between Pre-test and Post-test.

This table shows that statistically significant difference in the values of CVA between Pre-test and Post-test (**- $P \leq 0.005$)

GRAPH-I



COMPARISON OF CRANIOVERTEBRAL ANGLE (CVA) BETWEEN PRE AND POST TEST VALUES

TABLE-2

COMPARISON OF SCAPULAR INDEX (SI) BETWEEN PRE AND POST TEST VALUES

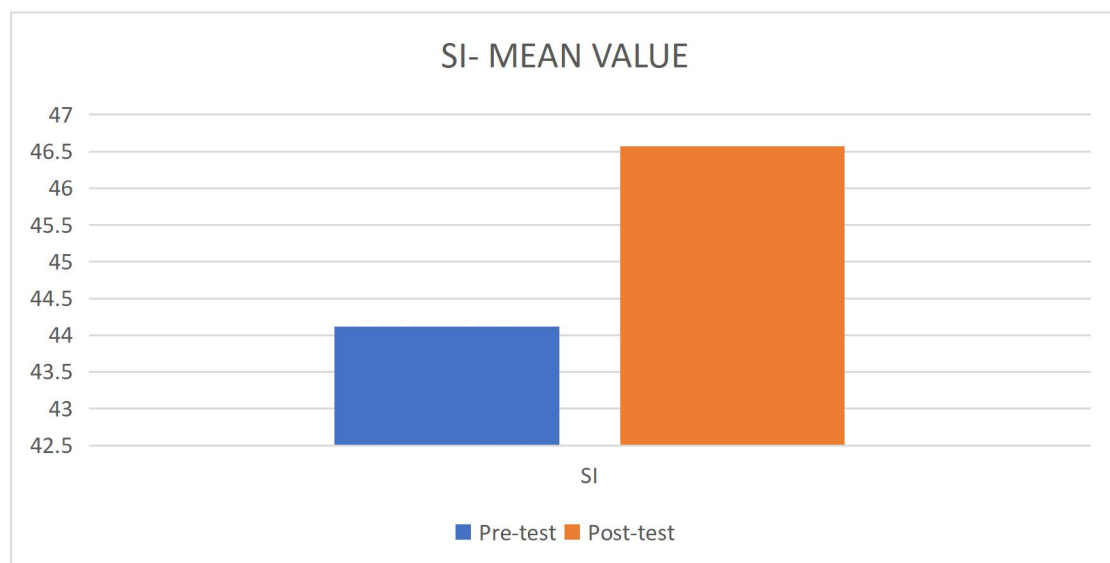
SI	MEAN	S.D	t-TEST	df	SIGNIFICANCE
PRE-TEST	44.12	3.96	-4.760	29	0.000***
POST-TEST	46.57	3.88			

(** $-P \leq 0.005$)

The above table reveals the Mean, Standard Deviation (S.D), t-Test, degree of freedom (df), and p-value of the scapular index (SI) between Pre-test and Post-test.

This table shows that statistically significant difference in the values of the SI between Pre-test and Post-test (**- $P \leq 0.005$)

GRAPH-II



COMPARISON OF SCAPULAR INDEX (SI) BETWEEN PRE AND POST TEST VALUES

RESULT

On comparing the Mean values of Pre-test and Post-test on Craniovertebral angle (CVA), it shows significant Mean differences between Pre-test (44.52) and Post-test (46.77) at $P \leq 0.005$

On comparing the Mean values of Pre-test and Post-test on Scapular index (SI), it shows significant Mean difference between Pre-test (44.12) and Post-test (46.57) at $P \leq 0.005$

Hence Null Hypothesis is rejected.

DISCUSSION

The present study "Effect of kinesiotaping with training programme on postural abnormalities among touchscreen smartphone users" was conducted to see the effect of kinesiotaping and training programme which include strengthening, stretching and ergonomic advices in correcting posture among smartphone users. The objective of the study to assess subject for postural mal-alignment such as forward head posture and forward shoulder posture. To find out the effectiveness of kinesiotaping with training programme in smartphone users. To compare pre and post test results of craniovertebral angle and scapular index after interventions.

The study was conducted with 30 subjects. Prior consent was taken. The treatment protocol was carried out for 5 days per week for 8 weeks. The outcome measures for the study were craniovertebral angle and scapular index. The result of this study showed that there was significant difference in improving craniovertebral angle and scapular index in smartphone users after 8 weeks of intervention by giving kinesiotaping and training programme which include strengthening, stretching and ergonomic advices. Paired t-test was used to analyze the effect of kinesiotaping with training programme among smartphone users and showed that there was significant improvement in craniovertebral angle and scapular index.

Carolyn Kisner, researches have proved that prolong use of smartphone in improper postures puts mechanical stretch on pain sensitive structures in the human body such as ligaments, joint capsule, blood vessels get either stretched or compressed and it causes pain. It is due to the compression of nerve endings. Further stress for longer period of time leads to breakdown of the tissue without an apparent injury. It is not possible to maintain correct posture with total relaxation of the muscles. It requires little muscle activity. Further continuous stress on the supporting structures lead to postural impairment. Postural correction exercises correct postural alterations like forward head posture and rounded shoulder posture.

Scapular stabilization exercises are found to be effective in increasing range of abduction and external rotation and in decreasing forward head and shoulder postures. Ergonomic advices help in maintaining the proper posture while using smartphone. This helps to correct the posture, to prevent further stress and to maintain the correct posture of an individual.

Pectoralis minor muscle lengthening by giving passive pectoralis minor stretch in supine lying position, 4 stretches of 30 seconds hold with 30 sec rest between each stretch. A similar study also done by the procedure of pectoralis minor stretching and showed good results. The pectoralis minor is a muscle that easily shortens and tightens due to many factors, including rounded shoulder posture, glenohumeral joint dysfunction, breathing dysfunction, and a variety of compensation patterns. The pectoralis minor is often the overactive muscle in these compensation patterns and hence called as the "King of compensation".

Taping might improve posture with applied prolong stretch on muscles. Muscle and collagen tissue are very adaptable and researches are indicating that prolonged and low load stretch are more effective than short term stretch. Kinesiotape maintain scapula in proper alignment and in this way applied prolonged stretch on tight structure surrounding shoulder and lengthening pectoralis minor and therefore can correct posture. And also on postural correction might be through altering muscle function, mechanical taping can applied in this way that place long and weak muscles to short position and lead to shift length tension curve to left and more muscle force production in inner-range because of optimization of overlapping actin-myosin in cross-bridge cycle. Possible explanation is that scapular taping in RSP might place pectoralis minor in lengthen position and weak posterior scapular stabilizer in shorten position and it is likely correct shoulder alignment with improve muscle function.

There are significant improvements in craniovertebral angle and scapular index. Table-1 shows that the Mean value of Pre-test (44.52) which when compared with Post-test (46.77) there is a significant difference between the Pre-test and Post-test on craniovertebral angle ($***P \leq 0.005$).

Table-2 shows that the Mean value of Pre-test (44.12) which when compared with Post-test (46.57) there is a significant difference between the Pre-test and Post-test on scapular index ($***P \leq 0.005$).

CONCLUSION

Conclusion of this study shows that kinesiotaping along with training programme which include strengthening, stretching and ergonomic advices are effective in improving craniovertebral angle and scapular index.

Strengthening and stretching increases blood supply to soft tissues, it can reduce tension and also to reduce pain. It could develop the muscle function and also to prevent muscle force and remove limitation of motion and also restore normal mobility to the joints. It is recommended that strengthening for weak, lengthened and inhibited muscles and stretching for tight, short and facilitated muscles.

Kinesiotaping improve posture with applied prolong stretch on muscles, also can place short muscles in lengthen position. It also improves circulation of blood and lymph by eliminating tissue fluid or bleeding beneath the skin, decrease pain through neurological suppression and relieve muscle tension.

Ergonomic advices are necessary in order to reduce further stress on spine and other body parts. This may reduce severity of neck and back pain symptoms and produce positive effects on mental and physical health.

LIMITATION AND RECOMMENDATION

LIMITATIONS:

- Small sample size is used
- Duration of the study was short
- Age group is limited
- Long term effect of the kinesiotaping was not assessed

RECOMMENDATION:

- Large sample size can be analyzed
- Longer duration of the study can be done
- Future research is needed on subjects in other age groups
- Long term effect of the kinesiotaping can be done.

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