

Effect of Posture Correction Exercises and Ergonomic Advices in People Having Postural Abnormalities among Chronic Smartphone Users

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ABSTRACT

Background: The evolution of technology had a massive impact on the human race at every stage of social development. Behavioural addiction such as smartphone addiction is one of them. Out of 20-25, 10% people face injuries due to smartphone. Such heavy smartphone users often present with the complaints of back pain, tendon injuries, carpal tunnel syndrome, radiation related problems and inattention blindness. Among 100 students of age 18-25, addiction was found to be low in 27%, moderate in 30% and high in 43%. Forward head posture and forward shoulder posture are two most common postural abnormalities seen in chronic smartphone users.

Objective: To find the effect of posture correction exercises and ergonomic advices in chronic smartphone users having postural abnormalities.

Materials and Methods: The subjects in Krishna University campus were screened and 45 subjects were given posture correction exercises and ergonomic advices. The interpretation of the study was done on the basis of comparing pre and post-test assessment of scapular index and craniocervical angle.

Result: In present study, Intra-group comparison showed that craniocervical angle and scapular index were statistically extremely significant, craniocervical angle ($p < 0.0001$), scapular index ($p < 0.0001$) in chronic smartphone users having postural abnormalities.

Conclusion: Posture correction exercises and ergonomic advices were significantly effective in correcting postural abnormalities such as forward head posture, forward shoulder posture in chronic smartphone users.

Key Words: Smartphone addiction, forward head posture, forward shoulder posture, craniocervical angle, scapular index, posture correction exercises

INTRODUCTION

Over past couple of decades advancing technology has 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 those. Smartphone

users globally are estimated to be 1.08 billion. Statistics suggests that the number is going to reach to 10 billion in next 5 years. In year 2014, 21.2% of India's population owned smartphone and it reached to 36% in the year 2018.

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]

Addiction is repeated use of device or substance despite of its negative effects.^[2] World Health Organization categorizes addiction into two forms. One is substance addiction such as alcohol or drugs and another is behavioral addiction such as mobile phone addiction.^[3] Among 100 students of age 18-25, addiction was found to be low in 27%, moderate in 30% and high in 43%.^[2] Research shows that an average person checks the smartphone every 6.3 minute in 16 hours of waking cycle. Out of 20-25, 10% people face injuries due to smartphone. Such heavy smartphone users often present with the complaints of back pain, tendon injuries, carpal tunnel syndrome, radiation related problems and inattention blindness. It also affects the mental health of an individual and may cause an individual to suffer from stress, anxiety, insomnia, depression, delinquency and aggressiveness.^[3]

Posture is defined as an attitude assumed by the body either with support during muscular inactivity or by means of the co-ordinated 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.^[4]

A good posture is defined as, keeping one's ears aligned with the shoulders and having the angel wings or shoulder blades retracted.^[2] Person attaining ideal posture put least stress on spinal structures. The commonest posture adapted by smartphone users is they bend their neck and stare at the mobile screen.^[2] This causes postural alteration and leads to neck pain. It is found that there is extremely significant correlation between smartphone addiction and forward head posture ($r=0.6470$, $p<0.0001$).^[2] Forward head posture is characterized by increased flexion of the lower cervical and upper thoracic regions, increased extension of the occiput on the first cervical vertebra and increased extension of the upper cervical vertebrae.^[4]

Craniovertebral angle (CVA) is used to assess the forward head posture.^[2] Craniovertebral angle is an angle formed by the horizontal line passing through C7 vertebra and a line extending from tragus of the ear to C7.^[2] More the use of smartphone with improper posture less is the craniovertebral angle. Normal value reported of craniovertebral angle is $>50^\circ$. Angle lesser than 50° is considered to be forward head posture.^[5]

Another most common postural deviation seen in heavy smartphone users is rounded or forward shoulders. Forward shoulder posture is defined as abduction and elevation of scapula and a forward position of the shoulders, giving an appearance of hollow chest.^[6] It is found that there is extremely significant correlation between rounded shoulders and smartphone addiction ($r= -0.4370$, $p<0.0001$).^[2] Scapular index is an important assessment tool use to assess rounded shoulders. Scapular index is calculated by measuring the distance from mid-point of the sternal notch to the medial aspect of the coracoid process and the horizontal distance from the posterolateral angle of the acromian to the corresponding thoracic vertebra and multiplying it with 100.^[2]

For objective assessment of smartphone addiction, smartphone addiction scale was made such that it will evaluate 6 points; daily-life disturbance, positive anticipation, withdrawal, cyberspace-oriented relationship, overuse and tolerance.^[7] It consists of 33 questions. Since it was difficult to compare between males and females' addiction of smartphone, short version of this scale was made.^[7] The modified version of this scale, smartphone addiction scale- short version (SAS-SV) was less time consuming and less expensive.^[7] It consists of 10 questions. Reliability of SAS-SV is 0.91.^[7] SAS-SV is a self-reported questionnaire. Thus the high score reflects self-awareness and seriousness about their smartphone addiction.^[7]

Since it is an emerging problem in this modern era, it is mandatory to create awareness amongst college going students about their smartphone addiction and the hazards related to its heavy use. Rehabilitation in the form of posture correction exercises and ergonomic advices are necessary in order to reduce further stress on spine. This may reduce severity of their neck and back pain symptoms and produce positive effects on mental and physical health. Thus this study is intended to rehabilitate such individuals.

MATERIALS AND METHODS

An approval for the study was obtained from protocol committee and institutional ethical committee of Krishna institute of medical sciences deemed to be university. The subjects in Krishna institute of medical sciences deemed to be university campus were screened to find out smartphone addiction. Subjects were included as per the inclusion and exclusion criteria. Participants were informed about the study and consent was taken. Pre-treatment assessment: Craniovertebral angle and scapular index was used to assess 45 subjects. Treatment protocol consists of the posture correction exercises and ergonomic advices. Post-treatment assessment was done for the same subjects after 4 weeks protocol.

Posture training exercises:

A. FORWARD HEADPOSTURE:

Stretching Exercises.

Posture correction exercises training for forward head posture includes stretching of tight muscles e.g.. Pectoralis major and minor, levator scapulae, upper trapezius, suboccipital muscles, sternocleidomastoid.

Strengthening Exercises.

Strengthening exercises for weak, lengthened, inhibited muscles e.g. Longus colli, longus capitis, rhomboids, serratus anterior, lower trapezius.

1. Chin Tucks
2. Chin Tucks against gravity.

3. Chin Nods.
4. Chin Tucks with axialextension.
5. Neck isometric exercises.

B. FORWARD SHOULDERPOSTURE: Range of motion exercises.

ROM exercises includes –

1. Wand exercises
2. Wall climbing
3. Overhead pulleys
4. Table top dusting
5. Wall washing.

Stretching Exercises.

Stretching exercises includes stretching of tight muscles e.g. Pectoralis major and minor, Subscapularis, Latissimus dorsi, Anterior deltoid, posterior capsule.

Strengthening Exercises.

In order to strengthen weak and lengthened muscles e.g. Middle and lower trapezius, Rhomboids, Posterior deltoid, Rotator cuff.

Scapular retraction with theraband.

Scapular retraction combined with shoulder horizontalabduction/extension.

Scapular retraction and abduction combined with externalrotation.

Upright press-up. (3 sets of 10 repetitions with a 60 sec hold between eachset)

ERGONOMIC ADVICES TO BE WHILE USINGSMARTPHONE: [8]

1. Hold the smartphone near chest level rather than waistlevel.
2. Avoid cradling the phone between your ear andshoulder.
3. Holding the phone to your ear with your hand can also cause fatigue so use Bluetooth headsetinstead.
4. Vary the way smartphone is held and alternate between using thumbs and the fingers whentyping.
5. Take breaks and change positions frequently while usingsmartphone.
6. Keep the wrists while holding ortyping.
7. Use features including predictive text or auto complete tools to reduce typing frequency.

8. Choose a smartphone that fits your hands properly.
9. Those who need to occasionally use their smartphone one handed, make sure you can hold the phone securely and still be able to tap with the thumb on all targets without strain.

Statistical Analysis:

Statistical analysis was done manually and by using the statistics software's INSTAT so as to verify the results derived. The statistical analysis of parametric data was

done by using paired t-test. Paired t-test was used for statistical analysis of pre and post intervention within the group.

RESULTS

Age Distribution

Table 1: Age Distribution

AGE GROUP	NO.OF INDIVIDUALS
18-21	16
22-25	29

Gender Distribution

TABLE 2: Gender Distribution

GENDER	NO.OF INDIVIDUALS
MALE	20
FEMALE	25

Outcome Measures

Table 3: Outcome measures pre-post

Outcome Measures	Pre-test	Post-test	P value	t value	Inference
CRANIOVERTBRAL ANGLE	48.82±3.193	51.4±3.460	0.0001	8.671	Extremely Significant
SCAPULAR INDEX	69.73±4.185	72.04±4.150	0.0001	8.963	Extremely Significant

DISCUSSION

Mobile phone addiction/abuse/misuse is one of the forms of compulsive disorder. Prevalence among 100 students of age 18-25, addiction was found to be low in 27%, moderate in 30% and high in 43%. [2] The present study "Effect of posture correction exercises and ergonomic advices in people having postural abnormalities among chronic smartphone users" was conducted to see the effect of posture correction exercises and ergonomic advices in correcting posture of chronic smartphone users.

The objectives of the study were to find out to find out smartphone addiction in college students. To assess subjects for postural mal-alignment such as forward head posture and forward shoulder posture. To find out the effectiveness of posture correction exercises and ergonomic advices in smartphone users. To compare pre and post test results of the posture correction exercises and ergonomic advices after interventions.

The study was conducted with 45 subjects. Prior consent was taken. The treatment protocol was carried out for 4 days per week for 4 weeks. The outcome

measures for the study were scapular index and craniovertebral angle.

The results of this study showed that there was significant difference in improving forward head posture and scapular index in chronic smartphone users after 4 weeks of intervention by giving posture correction exercises and ergonomic advices. Paired t-test was used to analyse the effect of posture correction exercises among chronic smartphone users and showed that there was significant improvement in craniovertebral angle ($p < 0.0001$) and scapular index ($p < 0.0001$).

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. [4] Further stress for longer period of time leads to breakdown of the tissue without an apparent injury. [4] It is not possible to maintain correct posture with total relaxation of the muscles. It requires little muscle activity. In totally relaxed muscles makes spinal curves more exaggerated. Further continuous stress on the supporting structures leads to postural

impairment. [4] Posture correction exercises correct postural alterations like forward head posture and rounded shoulder posture. It is found that deep neck flexors, isometric extension, prone chin tucks and chest stretches are effective in correcting forward head posture by improving craniovertebral angle. [9] Scapular stabilization exercises are found to be effective in increasing shoulder range of abduction and external rotation and in decreasing forward head and shoulder postures. [10] 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 corrected posture of an individual.

Limitations of this study were, number of subjects taken for the study was less and the study were limited to one institute and limited geographical area.

It is recommended that more number of subjects should be taken to conduct this study more effectively.

CONCLUSION

The present study provided evidence to support that the chronic use of smartphone leads to postural abnormalities like forward head posture and forward shoulder posture. In addition, results supported that posture correction exercises and ergonomic advices in improving postural abnormalities in chronic smartphone users with postural abnormalities.

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How to cite this article: Shete MG, Shah R. Effect of posture correction exercises and ergonomic advices in people having postural abnormalities among chronic smartphone users. Int J Health Sci Res. 2019; 9(7):121-125.
