

The Relationship between Addiction to Smartphone Usage and Protracted Shoulders, Forward Head Posture and Thoracic Kyphosis in College Students

Bhavika Bhalchandra Bomen¹, Shweta Kulkarni²

¹Intern, Department of Physiotherapy Tilak Maharashtra Vidyapeeth, Pune, Maharashtra, India

²Associate Professor, Department of Physiotherapy, Tilak Maharashtra Vidyapeeth, Pune, Maharashtra, India

Corresponding Author: Shweta Kulkarni

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ABSTRACT

Background: A smartphone is an electronic device which functions as a communication tool that has various application features that can be installed by all users. While with increase in use of smart phones, concerns have also increased about musculoskeletal problems due to its prolonged use. This caused people to assume static posture for prolonged period, causing continuous contraction of shoulder, head and neck muscles. Recently because of COVID situation students need to attend online lectures, which caused increase in number of hours of smartphone usage which increases its addiction among adults causing increase in musculoskeletal problems. Hence there was need to study the incidence and the relationship between smartphone addiction and protracted shoulders, forward head posture and thoracic kyphosis to create awareness, predict the risk factors and to prevent postural problems.

Objective: To study the relationship between addiction to smartphone usage and protracted shoulders, forward head posture and thoracic kyphosis in college students

Methodology: Ethical clearance was taken from ethical committee. Accordingly, 40 samples aged 18-25 were collected based on inclusion and exclusion criteria in and around the college campus of Pune. Each one was assessed using the nomophobia questionnaire, tragus to wall test and the scapular index.

Result: The results concluded that the correlation co-efficient(r) between Nomophobia questionnaire and tragus to wall test was -0.05288 on the sample size 40 and the correlation coefficient of Nomophobia questionnaire and scapular index found to be 0.05142.

Conclusion: The result of the study concluded that the relationship between smartphone addiction and forward head posture, protracted shoulders and thoracic kyphosis is non-significant.

Key Words - Smartphone, addiction, COVID, forward head posture, protracted shoulders, thoracic kyphosis

INTRODUCTION

Hand held devices (HHD) are those devices which are mainly used for communication and entertainment purpose, such as media, gaming and internet access.^[1] Many people are prone to various musculoskeletal disorders due to continuous use of these hand held devices which has become an important social health issue.^[1]

The use of smartphones is on the rise all across the world. It has a significant impact on personal relationships as well as mental and physical health. According to a poll on smartphone addiction completed by the American Psychological Association, the rate of smartphone addiction was higher than the percentage of internet addiction.^[2] According to a survey on smartphone

addiction conducted by the National Information Society Agency in 2012, the percentage of smartphone addiction was 8.4%, which was higher than the internet addiction rate of 7.7%.^[2] Posture is the alignment of the body segments at a particular.^[3] It must be equal to a specific body position in space which reduces the stress produced by anti-gravity on body tissues. Abnormal posture consists of poor connections between parts of the body.^[3] According to the 2015 Pew Internet and American Life Project, 85% of Americans aged 18–29 years owned a smartphone and 46% of smartphone users said that they could not live without a smartphone.^[4] The prevalence of smartphone devices has gradually increased, to the extent that the use of smartphones has become an indispensable part of life leading to various alterations to head and neck posture.^[4]

The head constitutes 6% of the total body weight, which is linked to the cervical spine and all other joints.^[5] Many people tend to flex their neck and maintain their head in forward position for placing a smartphone near waist or on the lap while sitting which lead to fatigue of neck and shoulders muscles. Normal posture is defined as when the line of gravity (LOG) passes through the external auditory meatus, the acromion and anterior to the thoracic spine.^[1,4] However, maintenance of a head in forward posture decreases cervical lordosis of the lower cervical vertebrae which creates a posterior curve in the upper thoracic vertebrae to maintain balance.^[6] Protraction and retraction movements also take place along with flexion and extension movement of neck in sagittal plane. Extension of upper cervical spine and flexion of lower cervical spine leads to protraction movement, whereas retraction movement results from flexion of the upper cervical spine and extension of the lower cervical spine. If the cervical spine is held in protracted position for prolonged period, it can lead to alterations in head posture causing poor posture known as forward head posture (FHP), which is thought to be

a deviation from neutral or normal posture.^[7] Normally, the cervical spine is lordotic in nature. Recent studies stated that the amount of cervical lordosis was found to correlate with the degree of thoracic kyphosis.^[7] Although thoracic spine is less mobile and, thus, more stable compared to the cervical region, increased cervical lordosis can lead to exaggerated thoracic kyphosis.^[7] Failure of the head to align with the vertical axis of the body can lead to further malalignments such as rounded shoulders and increased thoracic kyphosis to compensate for altered location of the LOG, leading to further impairments. Combination of all these postural deviations is known as “slouched posture”.^[7]

If the acromion processes are present more anteriorly compared with the mastoid processes, it can lead to forward shoulder posture (FSP) or rounded shoulders or protracted shoulders; which is characterized by protracted, internally rotated, anteriorly tilted, elevated, and abducted scapula along with winging of scapula.^[7] This poor alignment of the shoulders leads to greater torque production by gravitational forces, which is being offset by greater internal forces generated by muscles and other soft tissues around the shoulder. The passage of LOG anterior to the thoracic spine normally creates a flexion moment that is offset by the extensor muscles (ligamentum flavum, supraspinous ligaments, and posterior longitudinal ligament).^[7] Increased posterior convexity of the thoracic spine results in increased gravitational moment as well as increased distance between joint axes and line of gravity. In such a case, to maintain an upright posture, greater moment is produced by ligaments and muscles counterbalance the increased gravitational moment, thus leading to an increase in posterior convexity or kyphosis of the thoracic spine, also known as round back.^[7]

Although thoracic spine is less mobile and, thus, more stable compared to the cervical region, increased cervical lordosis can lead to exaggerated thoracic kyphosis. Recent studies stated that the

amount of cervical lordosis was found to correlate with the degree of thoracic kyphosis. With exaggerated thoracic kyphosis at the thoracic spine, anterior longitudinal ligament gets shortened and the anterior part of vertebral bodies gets compressed, leading to increases in intradiscal pressures.^[7] Also, the extensor muscles and posterior ligaments of the dorsal spine get stretched along with the capsules of the facet joints. The condition can cause pain. Hyperkyphosis might lead to complications such as poor respiratory function.^[7]

Forward head posture affects 66 % of people between the ages of 20 and 30, and it is more common in women (24.1%) than in men (9.1 %). Individuals whose forward head posture is reduced can improve their health.^[8] Trapezius muscle activity is higher in forward head posture compared to a neutral head posture. Forward head influences the range of motion in the cervical spine; the greater the angle of the forward head, the less movement the cervical spine can make.^[8] As a result, it's reasonable to conclude that this posture requires medical attention.

MATERIALS AND METHODS

Study design :- Observational study

Sampling method :- convenience sampling

Study duration- 6 months

Sample size-40

Study population- 18-25 years

Study setup- college campus in and around pune

Material required- Consent Form, Paper for documentation or worksheet, Pen/pencil, measuring tape

Ethical approval was taken from ethical committee of Tilak Maharashtra Vidyapeeth, Pune. Informed consent forms were provided to the participants before performing any tests with more information about the project. Participants were selected based on the inclusion and exclusion criteria. Severity of smartphone addiction was assessed using Nomophobia

Questionnaire (NMP-Q) ($r= 0.83 \pm 0.93$).^[9] Forward head posture and thoracic kyphosis was assessed using tragus to wall test($r= 0.93 \pm 0.95$).^[10] Protracted shoulders was assessed using scapular index($r= 0.77 \pm 0.94$)^[11]

TRAGUS TO WALL TEST:-To assess forward head and increased thoracic kyphosis, subjects are asked to stand with heels and buttocks against the wall (to prevent pivoting), knees extended and chin drawn in. The horizontal distance between the tragus (the auricular cartilaginous flap anterior to external auditory meatus) and a wall is measured using a measuring tape or retractable steel tape.^[5]



Fig-1 Assessment of tragus to wall test

SCAPULAR INDEX: - To assess for rounded shoulders, subjects are asked to stand normally with their hands hanging beside the body. The coracoid process, sternal notch, posterior edge of the acromion process and the adjacent thoracic vertebral spine are palpated and marked. Tape is used to measure the distance between the coracoid process and the sternal notch, as well as the distance between the posterior edge of the acromion process and the neighbouring thoracic vertebral spine.^[5]

The following formula is used to compute the scapular index:

Scapular Index – Distance between acromion process and sternal notch /

Distance between acromion process and spine × 100



Fig-2.1 Assessment of scapular index



Fig-2.2 Assessment of scapular index

Inclusion criteria

- Subjects with normal development
- Age of participants ranging from 18-25yrs

Exclusion criteria

- Patients with neurological disorder.
- Participants with history of inflammatory joint diseases.
- Participants with history of surgical interventions at neck and upper extremity

STATISTICAL ANALYSIS

The data on sample characterized were described on the basis of severity of smartphone usage and its score. The data has been represented in the form of graphical representation whenever it was applicable. For this data was collected, summarized, categorized and tabulated for the further statistical analysis.

RESULTS

Table 1- gender distribution

Gender	No of participants
Male	13
Female	27

Table 2- Distribution of patient according to severity

Interpretation of NMP-Q	No. of participants
Absent	0
Mild	1
Moderate	24
Severe	15

Interpretation: The above table shows that 1 participant has mild nomophobia, 24 participants have moderate nomophobia and 15 participants have severe nomophobia.

Table 3- Correlation coefficient of the questionnaire and the tests

Questionnaire and test	Correlation coefficient (r)
Nomophobia Questionnaire (NMP-Q) and tragus to wall test	-0.05288
Nomophobia Questionnaire (NMP-Q) and scapular index	0.002644

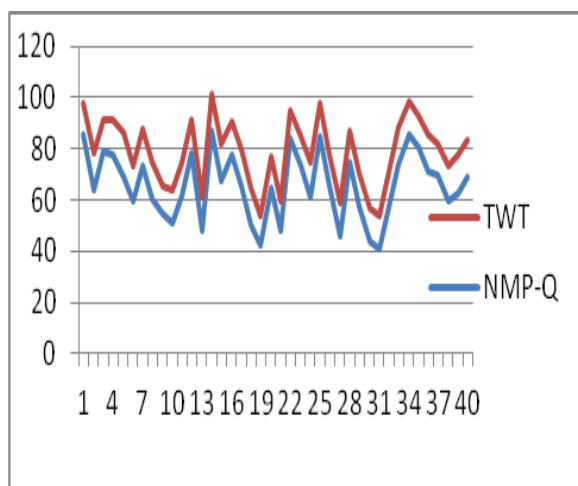


Fig.3.1- NMP-Q AND TWT

NMP-Q AND TRAGUS TO WALL TEST:- The correlation co-efficient(r) obtained was -0.05288 on the sample size 40 and the coefficient of determination was found to be 0.002797 .

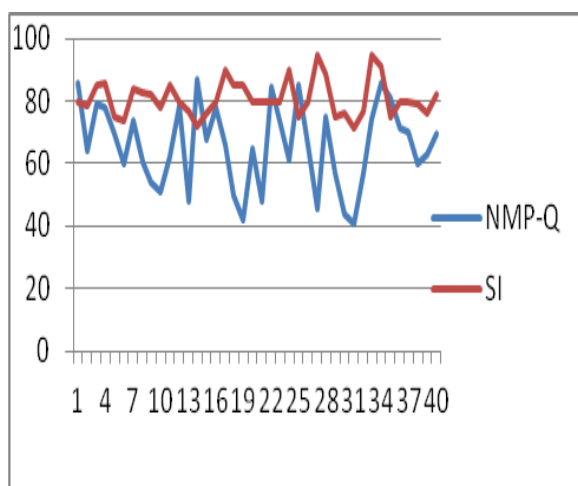


Fig.3.2- NMP-Q AND SI

NMP-Q AND SCAPULAR INDEX:- The correlation co-efficient(r) was found to be 0.05142 on the sample size 40 and the coefficient of determination was found to be 0.002644 .

DISCUSSION

Recently because of COVID situation students need to attend online lectures, which causes increase in number of hours of smartphone usage which increases its addiction smartphone among adults causing increase in musculoskeletal problems. In this study we are primarily focusing on the shoulder and neck posture

of young adulthood as they work more using smartphones, they may be prone to getting postural problems. Hence there is need to study the incidence and the relationship between smartphone addiction and protracted shoulders, forward head posture and thoracic kyphosis to create awareness, predict the risk factors and to prevent postural problems. Based on the inclusion and exclusion criteria 40 samples of age ranging between 18-25 yrs were collected among which 13 were males and 27 were females. Data was analysed using MS Excel. Table no 1 represents the gender distribution in this study. Table no 2 shows that 2% people have mild nomophobia, 60% people have moderate nomophobia and 38% people have severe nomophobia. Participants were provided with consent forms prior performing any tests and then the results were obtained. Later statistical analysis was done using SPSS software

Figure no 3.1 represents correlation between nomophobia questionnaire (NMP-Q) and tragus to wall test. According to linear (Pearson) correlation test it was found that the correlation co-efficient(r) of NMP-Q and tragus to wall test(TWT) was found to be -0.05288 (Table no 3) on the sample size of 40 and the coefficient of determination was found to be 0.002797 . The p value was found to be 0.7459 which is considered as not significant.

Figure no 3.2 represents correlation between nomophobia questionnaire and scapular index (SI). The correlation co-efficient of the NMP-Q and scapular index was found to be 0.05142 and the coefficient of determination was found to be 0.002644 (Table no 3). The p value was found to be 0.7527 which is considered as not significant. But the study concluded that the relationship between smartphone addiction and forward head posture, protracted shoulders and thoracic kyphosis is not significant. A study was conducted in 2016 which showed the similar results. It indicated negative association between smartphone usage, posture and rounded shoulders (Kim & Kim, 2016).^[12,13] The

primary cause for forward head posture is the muscle imbalance due to weakness of short deep cervical flexors, rhomboids, serratus anterior, middle and lower trapezius and tightness of the cervical extensors. The other studies suggested that irregular lower trapezius condition and serratus anterior positions due to abnormal scapular tilt can lead to rounded shoulders.^[13]

CONCLUSION

The study concluded that the relationship between smartphone addiction and forward head posture, protracted shoulders and thoracic kyphosis is not significant. Although by conducting this research, we tried to bring attention to potential risks that cell phones can cause to the users. This study result can be used as a warning signal to limit the excessive usage of phone and its dependency in students' population as it has negative impact on mental health status. The lack of teaching regarding ergonomic positions when using a smartphone contributes to bad posture. To maintain normal functionality, instruction on optimal posture when using a smartphone and the impacts of prolonged smartphone use is required.

Future scope

1. awareness of postural problems due to overuse can be done
2. larger sample size can be assessed
3. interventions can be done
4. study on different age groups can be done

Limitation

1. smaller sample size was assessed.
2. unavailability of required instruments.

Abbreviations:

Tragus to wall test (TWT)

Scapular index (SI)

Nomophobia Questionnaire (NMP-Q)

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