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CORRELATION OF MOBILE PHONE ADDICTION SCALE (MPAS) SCORE WITH CRANIOVERTEBRAL ANGLE, SCAPULAR INDEX AND BECK'S DEPRESSION INVENTORY SCORE IN YOUNG ADULTS

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ABSTRACT

Background: Mobile phone usage has become increasingly common in today's youth. Its heavy use often leads to an addiction. Dependency on these devices could lead to postural dysfunctions as well as produce an adverse effect on psychology. Hence, this study is done to correlate mobile addiction with the craniovertebral angle, scapular index and Beck's depression inventory score in young adults.

Methods: An observational study was performed on 100 subjects out of which 51 were males and 49 were females in the age group of 18- 25 years who were pursuing their graduation and post-graduation courses. Mobile Phone Addiction Scale was used to determine the level of addiction. Craniovertebral angle, Scapular Index, and Beck's Depression Inventory score were measured. Correlation of Mobile Phone Addiction Scale score with the above-mentioned parameters was done using GraphPad Instat Version 3.10 (Pearson correlation coefficient and Spearman correlation coefficient).

Results: Mobile phone addiction was found low in 27%, moderate in 30% and high in 43% participants. There is significant correlation of mobile phone addiction scale score with Craniovertebral angle ($r = -0.6470$, $p = <0.0001$), Scapular Index ($r = -0.4370$, $p = < 0.001$) and Beck's depression Inventory score ($r = 0.3172$, $p = 0.0013$).

Conclusion: This study shows that mobile phone addiction is common amongst the youth and it contributes to considerable stresses on neck and shoulder. It could even cause unfavorable repercussion on an individual's psychological status, such as depression. Hence, it is important to create awareness amongst the youth and take preventive measures for the same.

Keywords: Mobile addiction, craniovertebral angle, scapular index, depression.

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INTRODUCTION

The co-dependence of technology and society has been in practice for several years now. The need to simplify life has given birth to many new innovations which have been beneficial in different aspects of life; mobile phones being one of them. From connecting people via telephonic conversations to accessing the world in mere seconds, mobile phones have developed exponentially over the years.

In 2007, an Indian news magazine reported that 70% youth between the ages of 18 and 30 years owned a mobile phone[1]. This makes us envisage about the easy acceptance of these gadgets by the younger population and how its dependence is altering the behavior of individuals. The escalation of its use from "habit" to an "addiction," is slowly increasing among the masses with the need to evaluate them [2].

"Addiction is repeated use of device or substance despite its negative effects "[2]. Overuse or dependency on these little wonders have shown to produce adverse effects both on the physical and mental health and thus, it is important to further analyze them.

Rapid use of these devices can lead to abnormal functioning of the biological system and has led to serious ailments such as Alzheimer's disease, brain tumors, Parkinsonism, disorders of the brain like cancer and other complications [3]. Some of the physical adverse effects consist of disorders of the musculoskeletal system, which is due to wear and tear of soft tissues, leading to detriment of muscular fibers and muscle tone [4].

"A good posture is defined as, keeping one's ears aligned with the shoulders and having the angel wings, or the shoulder blades, retracted"[5] Ideal posture decreases spinal stress which happens to be the most efficient position for the spine [5].

While using a mobile phone, people usually have a habit of bending their neck to stare at the display screen in their hands. This augments the forward head posture and continuation of this attitude causes loss of the 'C' shaped curvature of the cervical spine. The cervical vertebrae start to curve forwards instead, altering the normal biomechanics of the spine causing postural alteration.

Apart from the physical changes, studies in the past by Park (2015), JH Ha (2008) have also found out that excessive mobile usage has produced adverse effects on the human psychology [5, 6]. Use of these devices has produced feelings of loneliness and isolation which is associated with interpersonal anxiety and obsession causing uncontrolled emotions which may even lead to serious incidents and fatalities [5].

Past literature by Park et al (2015), Lee et al (2016) and Jung et al (2016) and have reported the symptoms or complaints the mobile phone users experience while using their phones [5,7,8]. They range from neck pain, muscle tightness to altered cervical ranges. However, there is a paucity of literature on mobile phone use in the Indian population and its effect on posture and psychological status.

Therefore the aim of the study was to measure the craniovertebral angle, Scapular Index, and Beck's Depression Inventory Score among young adults and to correlate it with mobile phone addiction.

METHODOLOGY

Approval for the study was taken from the institutional research committee (Ref. no.KJSCPT/50 A/17-18). An observational study was conducted on 100 subjects consisting of 51 males and 49 females between the age group of 18-25 years who were pursuing their graduation and post-graduation courses. The data was collected from May 2017 to July 2017. Subjects were assessed for eligibility based on Inclusion and Exclusion criteria.

Young adults both males and females from 18-25 years of their chronological ages, pursuing their graduation or post-graduation and who had studied in English medium schools were included. All the subjects were right-handed dominant and were using a mobile phone for at least a period of 12 months.

Individuals with a history of pathological (traumatic, congenital and surgical) conditions around the spine and upper limb, head injury or a migraine were excluded. Also, individuals wearing spectacles, and/or have any other neurological or orthopedic conditions were not included in the study.

The study subjects were briefed about the study and a written consent was taken beforehand. For assessing the mobile phone addiction, Mobile Phone Addiction Scale by Dr. A. Velayudhan and Dr. S. Srividya was chosen [9, 10, 11]. Greater the score on the scale represents higher the level of addiction. The assessment of following outcome measures was done: Craniovertebral Angle, Scapular Index, and Beck's Depression Inventory Scale.

Craniovertebral angle was assessed to find out forward head posture. In his/her usual standing posture lateral view photograph was clicked using a digitized camera. (Kodak C160 digital camera was used for the study.) Subjects were told to stand relaxed with their arms resting on the side of the body. The instruction was given to virtually focus on a point on the wall directly ahead of them. The camera was arranged on a tripod, 60cm farther from the left side of the subject[12]. The height of the tripod was modified to frame the head from the top to the base of the clavicle [13]. Image distortion was minimized by placing circular spirit level at the base of the camera to ensure it was perpendicular to the horizontal. 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 a line extending from the tragus of the ear to C7. The image was then uploaded to a computer software MB-ruler (version 5.3) and the angle was calculated.

Picture 1: Measurement of Craniovertebral angle

To assess rounded shoulders, Scapular Index was determined. Participants were made to stand in a relaxed posture with hands hanging by their sides. 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 the above-mentioned points anteriorly and the distance between the points posteriorly was measured with the help of a measuring tape and noted for further computation. The following formula was used to calculate scapular Index [8].

Scapular Index = (SN to CP X 100) / (PLA to TS)

Where, *SN* = Sternal Notch, *CP* = Coracoid Process, *PLA* = Postero Lateral Angle of acromion and *TS*= Thoracic Spine (length of the back side) (Picture: 2 and 3)

Picture 2: Measurement from sternal notch to coracoid process. (For Scapular Index)

Picture 3: Measurement of the posterolateral angle of acromion to thoracic spine. (For Scapular Index)

To assess the mood disorder, Beck's Depression Inventory was given to respond. The score obtained was then divided into Normal, Mild mood disturbance, Borderline clinical depression, Severe depression and Extreme depression.

Data Analysis

The collected data was analyzed statistically using Graph-Pad Instat. The descriptive statistics was done for age group, gender, qualification and to analyze the level of addiction for mobile usage. The mobile phone addiction score, Craniovertebral Angle measurement, Scapular Index measurement and Beck's Depression Inventory Scale Score were checked for normality using D'Agostino and Pearson normality test. Correlation of Craniovertebral Angle with Mobile Phone Addiction Scale score was calculated using Pearson's Correlation coefficient, and, similarly, the correlation of Scapular Index measurement and Beck's Depression Inventory Scale with Mobile Phone Addiction Scale score was measured using Spearman's correlation coefficient.

RESULTS

For statistical analysis collected from 100 subjects, data passing normality test Pearson correlation coefficient test was applied and Spearman correlation coefficient test was applied to the data which did not pass the normality test. The level of significance of the study was set at $p < 0.05$.

Table 1: Age of participants

Age	18	19	20	21	22	23	24	25
Frequency	14	17	12	10	15	15	10	07

Graph 1: *Age of participants*

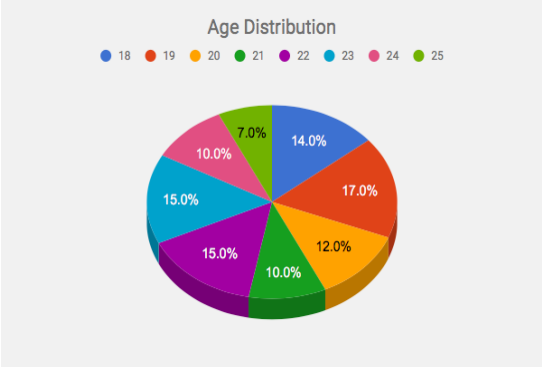


Table 2: Gender distribution

Gender	Frequency	Percentage
Males	59	59%
Females	41	41%

Graph 2: *Gender distribution*

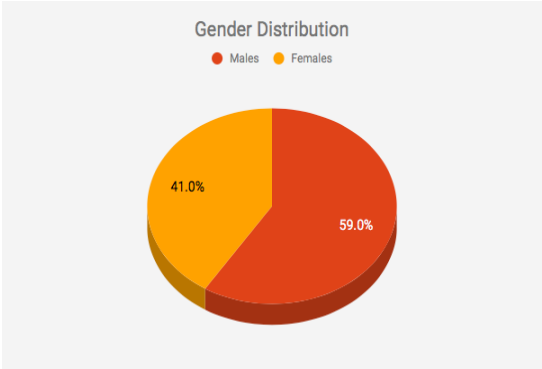


Table 3: Qualification distribution

Qualification	Frequency
Undergraduate	64
Post-graduate	36

Graph 3: *Qualification distribution*

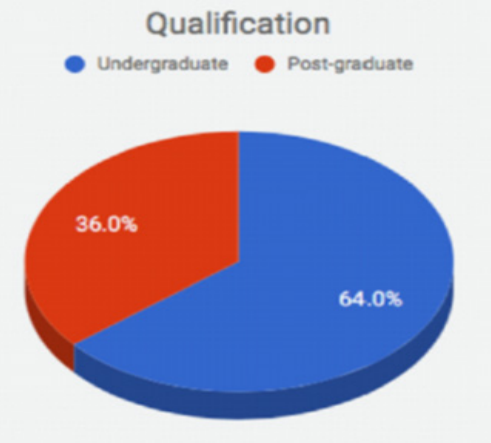


Table 4: Mobile phone addiction distribution

Addiction	Frequency
High	43
Moderate	30
Low	27

Graph 4: *Mobile phone addiction distribution*

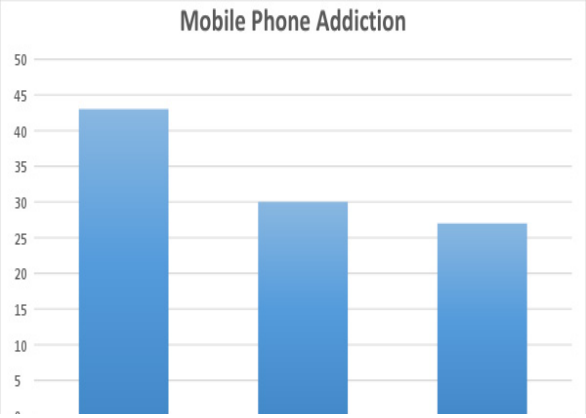


Table 5: Correlation of Mobile Phone Addiction Scale (MPAS) score with craniovertebral angle (CVA)

MPAS Score		CVA		Pearson's correlation coefficient (r value)	'P'Value	Significance
Mean	S.D.	Mean	S.D.			
113.2	± 36.3	49.8	±5.6	- 0.6470	<0.0001	Extreme significance

Graph 5: *Correlation of Mobile Phone Addiction Scale (MPAS) score with Craniovertebral Angle (CVA)*

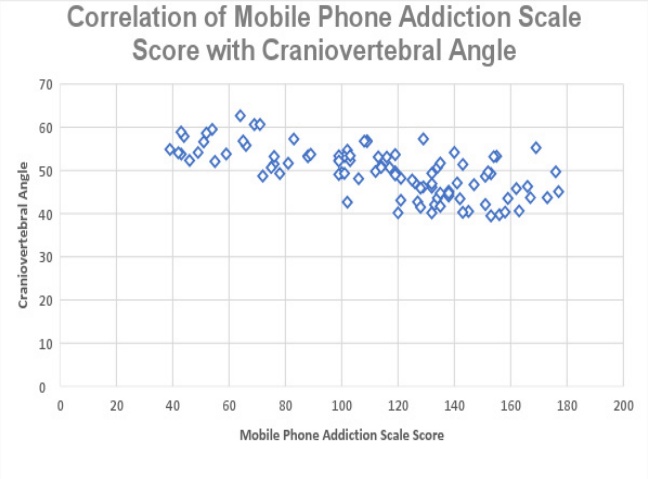


Table 6: Correlation of Mobile Phone addiction Scale (MPAS) score with Scapular Index (SI)

MPAS Score		SI		Pearson's correlation coefficient (r value)	'P'Value	Significance
Mean	S.D.	Mean	S.D.			
113.26	± 36.3	65.0	±4.1	- 0.437	<0.0001	Significant

Graph 6: *Correlation of Mobile Phone Addiction Scale (MPAS) score with Scapular Index (SI)*

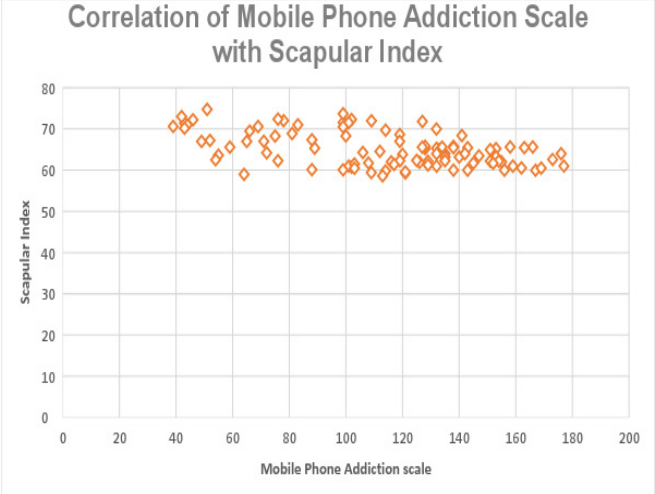
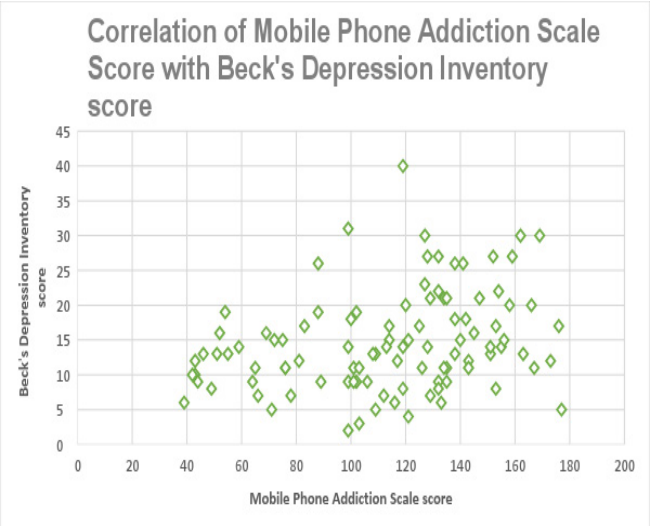


Table 7: Correlation of Mobile Phone Addiction Scale (MPAS) score with Beck's Depression Inventory (BDI)

MPAS Score		BDI		Spearman's coefficient correlation (r value)	'P'Value	Significance
Mean	S.D.	Mean	S.D.			
113.2	±36.3	14.6	±7.1	0.3172	<0.0001	Significant

Graph 7: *Correlation of Mobile Phone Addiction Scale (MPAS) score with Beck's Depression Inventory (BDI)*



DISCUSSION

This study was conducted in an urban set up (Mumbai) on 100 young adults pursuing their graduation and post-graduation degree between the age group of 18 to 25 years (mean=21.09, SD =±2.123). Out of this 59 subjects were male and 41 were female.

Mobile Phone Addiction Scale (MPAS) was used to determine the level of mobile addiction in the study subjects and it was observed that 43% participants had a high level of addiction, 30% had a moderate level of addiction, whereas 27% participants had a low level of mobile addiction.

The revolutionizing nature of technology gives us a greater access to knowledge, limitless opportunities to grow and broaden our horizon. Despite this feat, due to the increasing amount of time people spend on this branch of applied science through mobile phones and other electronic gadgets, the potentially harmful effects it produces on the quality of life, cannot be ignored and thus, investigations of present study on mobile phone usage and its correlation with physical and psychological changes are important.

According to Peel et al (1995), "any form of extreme behavior is addictive" [14]. And although the meaning of addiction has come a long way behind substance abuse, it includes several psychological addictions such as gambling or overeating [11]. Researchers explicate that these addictions are associated with social needs and stress the individual faces in his life [11]. Similarly, the mobile phone dependency arises from such needs and it is now slowly moving towards addiction. The continuous need for these gadgets not only affects the human behavior but also brings about physical changes in the body.

The most common postural abnormality is forward head posture (FHP). On using a mobile phone in the common attitude of head flexion, there is an increase in the weight supported by the spine [5]. This results in a loss of normal spinal curvature and hence, greater load is placed on the cervical vertebrae, leading to a forward head attitude [5]. Moreover, according to Lee et al (2016) on using mobiles, individuals who already suffer from neck strain, tended to flex their neck slightly more than individuals without neck pain [4]. Hence, it becomes a vicious cycle which eventually leads to discomfort and aches.

In our study, the forward head posture was determined by measuring the Craniovertebral Angle. Its correlation with Mobile Phone Addiction Scale (MPAS) was done using Pearson's correlation, which was found to be extremely significant (r=-0.6470, p=<0.0001). From this result, it can be stated that as the level of addiction increases, the craniovertebral angle decreases, which is an indication of a forward head posture.

The findings obtained for craniovertebral angle were similar to those obtained in the studies done by Park (2015) and Jung (2016) who had achieved similar results on smartphone usage. [5, 8]. Kim et al (2013) in their study concluded that the increased cervical flexion angle was more in the prolonged smartphone user category as compared to its control group which is similar to our readings [15].

This study also intended to know about the association of mobile phone addiction with rounded shoulders. Since a slouched posture with shoulders protracted is considered as a postural abnormality, our study aimed to determine if the mobile phone addiction could affect the postural alignment of shoulders. The correlation of MPAS with Scapular Index was determined by Spearman's correlation which was found to be extremely significant. (r=-0.4370, p= <0.001). It was noted that subjects who showed a high level of mobile phone addiction had a decreased Scapular Index. This evaluation implies that there is reciprocity of rounded shoulders and mobile phone addiction in the participants.

The literature on this subject by Jung et al (2016) has concluded that having a sedentary lifestyle produces a higher chance of acquiring rounded shoulders [8]. Similarly, in our study, subjects who showed high mobile phone addiction, maintained shoulder and elbow in flexed position. This posture was attained in order to hold the mobile phones, which eventuated to an increased rounded shoulder. If the alignment of the body is incorrect, the spinal stresses are increased, giving an inefficient spinal posture, which could even lead to upper quarter pain [16].

Apart from the physical changes, our research also aimed to understand the interrelationship of mobile phone usage and behavioral changes. On interpretation, it was noted that smartphone addiction and depression had a significant correlation. This correlation was determined with Spearman's correlation (r=0.3172, p=0.0013), the results of which were similar to that of Kimberley (2014) and Hwang, Yoo and Cho's (2012) studies, where a smartphone addiction and depression shows conclusive correlation [17, 18].

Since a high dependency on these gadgets is associated with unhealthy lifestyle and psychological distress such as anxiety, depression (Thomée et al, 2011), individuals who use their mobile phones constantly, have less time or inclination for other social interactions [19]. This could give rise to feelings of loneliness and self- withdrawal [20]. If not attended at the right time, these feelings could further give rise to self-harm thoughts or tendencies [11].

The limitation of the present study was that the physical fitness levels of subjects were not taken into consideration

and correlated. Similarly, subjects' other leisure activities were not assessed. For gaining more insight on this regard, physical well-being and recreational activities of an individual should be considered to get a thorough understanding of the postural and psychological changes in mobile phone addicts. Therefore, in future, research should be done to study the effect of postural awareness and physical exercises on posture in mobile phone addicts.

CONCLUSION

Thus, we conclude that mobile phone addiction not only causes physical adverse effects, but also leads to psychological distress. Thus, early intervention in the form of physical exercises and psychological counseling will in turn help rehabilitating the individual as a whole.

Abbreviations' List

MPAS: Mobile Phone Addiction Scale

CVA: Craniovertebral Angle

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