

THE EFFECT OF SMARTPHONE ADDICTION ON CRANIOVERTEBRAL ANGLE AND DEPRESSION STATUS AMONG UNIVERSITY STUDENTS

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ABSTRACT

Background: The usage of smartphone is in an increasing trend worldwide. It brings remarkable changes over personal relationships and also in both mental and physical health status. The percentage of smartphone addiction was higher than the internet addiction based on a survey of smartphone addiction completed by the National Information Society Agency in 2012.

Objective: The objective of this study was to analyze the effect of smartphone addiction on craniovertebral angle and depression status among university students.

Materials and Methods: This was a cross-sectional study design with a purposive sampling method. Total of 68 subjects were elected for this study and classified in to regular user group and heavy user group. Smartphone Addiction Proneness Scale (SAPS) questionnaire and self-reported Beck Depression Inventory (BDI) were used to measure the level of smartphone addiction and depression symptoms respectively. The forward head posture was evaluated by measuring the craniovertebral angle (CVA) using photographic image method.

Results: CVA and depression status between the groups were analyzed by independent 't' test. The mean CVA of regular user group was 49.83±5.54 and heavy user group was 50.68±3.44. The p value was > 0.05. There was no significant change in CVA between regular user and heavy user groups. The mean of depression status in regular user group was 13.5±6.67 and heavy user group was 18.79±7.55. The p value was < 0.05. There was a significant change in the depression status between regular user and heavy user groups.

Conclusion: Smartphone addiction has no effect on CVA but it could negatively affect a person's depression status.

KEY WORDS: Smartphone addiction, Craniovertebral angle, Forward head posture, Depression.

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INTRODUCTION

The usage of smartphone is in an increasing trend worldwide [1]. Smartphone integrates several technologies which makes an extensive usage of this device as a computer, calculator, camera, video player, web browser, social media and video games other than as a mobile phone [2].

It brings remarkable changes over personal relationships and also in both mental and physical health status [3]. Nowadays, addiction is not only applicable to drug or substance abuse, but it also refers to smartphones which falls under the category of behavioral addiction. It is mostly noticed in adolescent age groups [4].

The percentage of smartphone addiction was 8.4%, which was higher than the internet addiction of 7.7% based on a survey of smartphone addiction completed by the National Information Society Agency in 2012 [5]. The percentage of mobile phone usage in Malaysia in the year 2013 and 2015 was 94.2 % and 97.5 % respectively. Percentage of individuals in Malaysia aged fifteen years and above using internet was 71.1% in the year 2015. In 2015, the prominent internet activities that engaged internet users were participating in social networks (84.3%) and playing games (76.1%) [6]. In Malaysia, around three hours a day was spent by an average smartphone user on his/her device and a major proportion of these users spent time on chatting and social media. 97.4% of Koreans in their twenties owned a smartphone in the year 2013. An average smartphone user in Korea spends about 4.1 hours whereas 5.4 hours a day is spent by a heavy smartphone user on his/her smartphone.

Heavy use of smartphone is associated with anxiety, headache, insomnia, depression, poor sleep quality, fatigue, decreased concentration level and mobile phone dependency [9,10].

Forward-head posture is observed while using a smartphone for longer duration which may cause upper crossed syndrome and its related symptoms [8]. This study focus on university students as most of them does own a smartphone and use it on regular basis. The objective of this study was to analyze the effect of smartphone addiction on craniovertebral angle and depression status among university students.

MATERIALS AND METHODS

This was a cross-sectional study design with purposive sampling method. Total of 68 subjects were elected for this study and classified in to regular user group (34 subjects) and heavy user group (34 subjects) based on the SAPS. The inclusion criteria were both male and female students with age range of 18-29 years, absence of congenital spinal deformities, absence of spine injuries and surgical history and absence of limb length inequality. The study was conducted in Asia metropolitan university (AMU) and the university research ethical committee

approved the study. The study procedures and its objectives were clearly explained to all the subjects taking part in this study before informed consent was obtained from them.

Study procedures and outcome measures: Smartphone Addiction Proneness Scale (SAPS) questionnaire and Self-reported Beck Depression Inventory (BDI) measure the level of smartphone addiction and depression symptoms respectively. SAPS and BDI were distributed to all the subjects after an informed consent was obtained from the subject. The forward head posture was evaluated by the craniovertebral (CV) angle by using photographic image method.

The Smartphone Addiction Proneness Scale (SAPS) questionnaire: The SAPS includes 15 items that are scored with a four-point Likert scale (1: "strongly disagree" and 4: "strongly agree"). This questionnaire serves as a screening tool to identify the high-risk subjects among smartphone addicted individuals and suffices as an effective means to predict smartphone addiction. The items were structured around four subdomains: disturbance of adaptive functions (5 items), withdrawal (4 items), tolerance (4 items) and virtual life orientation (2 items). A greater score indicates a higher degree of addiction. If the score was 44 points or more, the subject was placed in the high-risk user group; subjects scoring 40–43 points were placed in the potentially dangerous user group, while those who scored 39 points or less were classified as the regular user group. This scale has shown good reliability and validity for the assessment of smartphone addiction [8,11,12]. In this study, subjects scored ≥ 40 were labelled as heavy user group and subjects scored < 40 was categorized as regular user group.

The Self-reported Beck Depression Inventory: It consists of 21-questions and is a multiple-choice self-report inventory. It is a widely used instrument for measuring the severity of depression status. Each item is rated on a 4-point Likert-type scale which ranges from 0 to 3, based on the subject's severity in the last two weeks. The total score ranges from 0 to 63. Any subject scoring within 1-10 are considered having normal ups and downs in their depression status. Those who score between 11-16 have

mild mood disturbances, who score 17-20 have borderline clinical depression, between 21-30 suffer from moderate depression, 31-40 experience severe depression and scores over 40 indicate extreme depression symptoms. It is found to be a reliable tool for measuring the severity of depressive symptoms in adolescents [13-15].

Craniovertebral angle: The subject was asked to sit with an upright neutral posture on a chair and lateral photograph of the spine was taken. Adhesive markers were fixed on the ear tragus and the spinous processes of seventh cervical vertebra. A vertical plumb line was suspended from a platform attached to the wall. The image J software was used to draw a horizontal line perpendicular to the plumb line. The craniovertebral angle was then measured as an angle drawn between a line from the ear tragus to the seventh cervical vertebra and the horizontal line. Subjects with forward head posture had a significant smaller craniovertebral angle when compared with their normal counterparts. The average range of this angle is 42 to 54°. In this study, the craniovertebral angle more than 50° and ≤ 50° were considered normal and abnormal respectively. This angle is considered to be a valid and reliable assessment tool to assess the forward head posture. Its measurement using the lateral photography method in seated position reliably can measure natural head/neck posture in the sagittal plane [16-20].

Statistical analysis: Data were analyzed by descriptive statistical method using frequency and percentage. Independent 't' test was used to analyze the difference of CVA and depression status between regular user and heavy user groups. A 2-tailed p value of < 0.05 was considered statistically significant. Data were analyzed using the Microsoft excel 2010 and SPSS 20 version.

RESULTS

Total of 68 subjects (mean age of 23.54±2.6) were recruited for the study on the basis of inclusion criteria. Both regular user and heavy user groups comprised of 34 (17 males, 17 females) subjects based on smartphone addiction. The percentage of normal and

abnormal CVA and depression status are explained in Tables 1 & 2. The percentage of normal CVA between regular user group and heavy user group comprised of 55.88% and 58.82% respectively. The percentage of abnormal CVA between regular user group and heavy user group comprised of 44.11% and 41.17% respectively. The percentage of depression status of normal, mild, moderate, borderline and severe for regular user group was 32.35%, 38.24%, 5.88%, 23.53% and 2.94% respectively. The percentage of depression status of normal, mild, moderate, borderline and severe for heavy user group was 11.76%, 17.65%, 35.29%, 23.53% and 11.76% respectively.

CVA and depression status between the groups were analysed by independent 't' test which is explained in Table 3. The mean value of CVA of regular user group was 49.83±5.54 which was lesser than the mean value of heavy user group 50.68±3.44. The p value was > 0.05. There was no significant change in CVA between regular user and heavy user group. The mean value of depression status of regular user group was 13.5±6.67 which was lesser than the mean value of heavy user group 18.79±7.55. The p value was < 0.05. There was a significant change in depression status between regular user and heavy user groups.

Table 1: Percentage of normal & abnormal CVA on the basis of smartphone addiction.

CVA	Smartphone addiction	
	Regular user group	Heavy user group
Normal (>50°)	19 (55.88%)	20 (58.82%)
Abnormal (≤50°)	15 (44.11%)	14 (41.17%)

Graph 1: Percentage of normal & abnormal CVA on the basis of smartphone addiction.

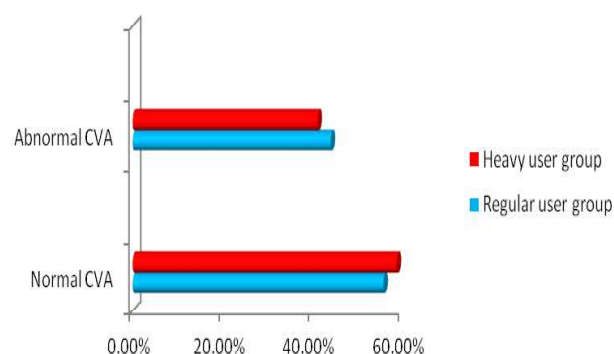


Table 2: Percentage of depression status on the basis of smartphone addiction.

Depression status	Smartphone addiction	
	Regular user group	Heavy user group
Normal	11 (32.35%)	4 (11.76%)
Mild	13 (38.24%)	6 (17.65%)
Moderate	1 (2.94%)	13 (38.24%)
Borderline	8 (23.53%)	7 (20.59%)
Severe	1 (2.94%)	4 (11.76%)

n: frequency, % : percentage.

Graph 2: Percentage of depression status.

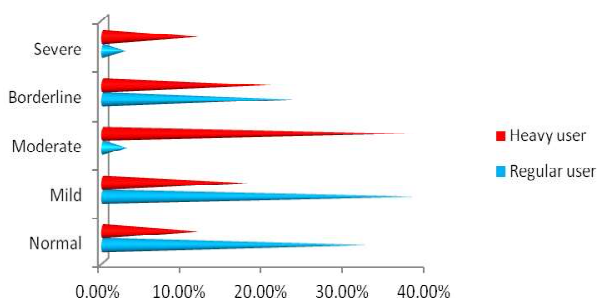


Table 3: Comparison of craniovertebral angle and depression status between regular user and heavy user group.

Variables	Regular user group		Heavy user group		Mean change	95% CI of Mean change	t' Value	Sig. p < 0.05 (2-tailed)
	Mean	SD	Mean	SD				
CVA	49.83	5.54	50.68	3.44	-0.84	-3.08, 1.38	-0.75	0.452
Depression	13.5	6.67	18.79	7.55	-5.29	-8.74, -1.84	-3.06	0.003

DISCUSSION

This study results show that the percentage of normal CVA was less and abnormal CVA was high in regular user group compared to heavy user group and also there was no significant change ($p > 0.05$) in CVA between the groups. Thus, it is very clear that smartphone addiction is not a noticeable factor to bring change in CVA among university students. The study result is consistent with the previous study conducted by Park et al [21] which reported that heavy users of smartphone do not produce considerable change in CVA due to concomitant change in thoracic region based on their lower cervical spine changes while using smartphone in usual positions [22,23]. This study result contradicts previous few studies as they were conducted on the basis of duration of smartphone usage [22,24,25]. The primary cause for forward head posture (low CVA) 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

and pectorals [26-28]. In many instances, decrease in CVA is associated with headache, neck pain, rounded shoulders, thoracic kyphosis, myofascial pain syndrome and TMJ disorders [17,29].

Based on the study results, the percentage of normal and mild depression status were higher in regular user group than heavy user group. But, the percentage of moderate and severe depression status were much higher in the heavy user group than regular user group. In a nutshell, almost 70.5% of subjects in the heavy user group exhibited higher levels of depression status (Moderate, Borderline & Severe) compared to the regular user group which holds only 29.4%. There was a significant difference ($p < 0.05$) in depression status between regular and heavy user groups. So, smartphone addiction can be considered as the most important risk factor to bring severe depressive

symptoms among university students. This result is similar with few previous study results [8,21]. Heavy use of smartphone has been associated with depression and other mental health symptoms [10]. The reason for higher percentage of depressive symptoms among heavy user group might be due to decrease in face-to-face interactions, addiction to smartphone usage and loneliness [21,30]. Bright light from the screen of smartphones may suppress melatonin secretion which leads to delay in sleep onset further contributing to depression [31,32]. The limitations of our study were less sample size and weak sampling technique. Future studies can be conducted to relate CVA and depression status with duration and frequency of smartphone usage.

CONCLUSION

Based on this study, it is concluded that smartphone addiction has no effect on CVA but it could negatively affect a person's depression status. This study result can be used as a warning signal to limit the excessive usage of smart-

phone and its dependency in students' population as it has negative impact on mental health status.

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