Original Article

Knowledge and Practice of Proper Ergonomic Posture during Smartphone use by Undergraduate Students in College of Medicine University of Lagos, Nigeria

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Abstract

Background: Literature is replete with the reports of adverse impacts of smartphones on physical, psychological and mental health of users. Hence, the knowledge of the risks associated with smartphones and the proper ergonomics adopted during its usage may be an important preventive tool. This study investigated the knowledge and practice of proper ergonomic posture during smartphone use by undergraduate students of a university medical college. **Materials and Methods:** A cross-sectional analytical survey involving 231 undergraduate students of a university college of medicine. The instrument was a 21-item self-administered questionnaire adapted from previous studies and comprised of four sections. Section A collected information on the sociodemographic data of participants; Section B, on smartphone use by participants; Section C, on their knowledge of proper ergonomic posture during smartphone use and Section D, on their practice of proper ergonomic posture. Data were presented using the descriptive statistics of mean and percentages with the level of significance at $P \leq 0.05$. **Results:** Almost a third of the respondents 66 (28.6%) use their phones 4–6 h daily, whereas nearly one-third of the respondents use their phones for >12 h daily. Furthermore, majority of the respondents 124 (56.7%) have poor knowledge of proper standing ergonomic posture, 194 (84.0%) have poor knowledge of proper sitting ergonomic posture, whereas 149 (64.5%) have poor knowledge of proper wrist ergonomic posture. More than half of the respondents 126 (54.7%) do not have good practice of proper ergonomic posture when using smartphones. **Conclusion:** Medical college students possess poor knowledge or practice of proper ergonomic posture during smartphone use. Furthermore, more than half of the respondents do not practice proper ergonomic posture while using their smartphone.

Keywords: Ergonomic posture, knowledge, practice, smartphone use, undergraduate students

Introduction

Smartphones are increasingly popular not only for phone calls but also for Internet, text messaging, applications and games.[1] A Wireless Intelligence survey found that in 1 month, using applications accounted for an average of 667 min of smartphone usage, 671 min of messaging time, 531 min of voice calling and users web browsing of 422 min.[2] Furthermore, International Data Corporation conducted a study which showed that 79% of the population between the age group of 18 and 44 years have their cell phones with them almost all the time with only 2 h of their waking day spent without their cell phones on the hand.[3] According to Pearson, 72% of college students own smartphones, up from just 50% in 2011 and two-thirds reported using their smartphones for school work.[4] Furthermore, it has been reported that 92% of college students use smartphones to send and receive e-mail messages.[5] A previous study conducted to understand smartphone usage trends found some striking results.[6] Whereas some users interact with their smartphones for about 30 min per day; perceived heavy users did so for 500 min, while the average individual users interacted with their phones for about 10–200 times per day.

Access this article online

Quick Response Code:

Website: www.njotonline.org

DOI: 10.4103/njot.njot_31_20

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How to cite this article: Okafor UA, Akinbo SR, Takuro NV, Oghumu SN. Knowledge and practice of proper ergonomic posture during smartphone use by undergraduate students in college of medicine university of lagos, Nigeria. Niger J Orthop Trauma 2021;20:1-6.

Submission: 22.08.2020 **Revision:** 06.03.2021
Acceptance: 31.03.2021 **Web Publication:** 09.07.2021

The literature is replete with the reports of adverse impact on physical, psychological and mental health toward the users of mobile and other information technology.[7,8] The musculoskeletal effects of smartphone usage are probably the results of default ergonomics. Previous studies have associated smartphone use with De Quervain's tenosynovitis and osteoarthritis.[9-11] A study at the University of Waterloo showed that heavy users of portable mobile devices reported thumb, shoulder and neck pain.[12] Furthermore, prolonged head flexed posture or forward head posture (holding the phone up to the ear) while using a smartphone can cause problems with the elbows, neck and shoulders. This is because the awkward head positions place strain/stress on the soft tissues of the neck, shoulders, elbows and fingers which is capable of predisposing the users to neck and upper thoracic pain.[13-15] Text messaging while sitting caused the largest head flexion than that of other task conditions.[13] Recently, it is purported that text neck is becoming an epidemic that could lead to permanent damage to neck posture, this seems to be a worldwide health effect.[13,16,17] There are also reports on smartphone-derived conditions such as 'Blackberry thumb' which often refers to repetitive strain injury caused by texting, 'iPad hands,' carpal tunnel syndrome, trigger fingers, as well as aches and pains caused by swiping and typing.[13,18,19]

More appalling is the sedentary lifestyle and sleeplessness that is coupled with the use of smartphones both of which are capable of leading to serious health consequences.[7,20] This is a major concern among young adults and is an important concern for health experts as people's contemporary lifestyles have become much dominated by computer technology resulting in overuse in digital tasks on handheld mobile technologies.[7] Furthermore, experts say the brain gets a hit of dopamine and serotonin when phones beep or ring.[21] These chemicals have been purported to be the dominant chemical content found in the brains of hard drug users.[16,22] A recent review shows that smartphone addiction exists.[23] In fact, nomophobia (the fear of being without your mobile device) is now recognised as a serious issue.[24,25] A recent study found that addiction in the use of smartphones is associated with awkward postures among university students.[26]

Given the risks associated with the use of smartphones, several solutions have been proposed including postural advice (positioning, time-pacing and frequency), exercise therapy, therapeutic recreation, screen time recommendations and behavioural change.[15,27-29] However, it is suggested that the most important preventive tool is knowledge of both the risks associated with smartphones and proper ergonomics to adopt during usage.[30] Literature is sparse on the knowledge and practice of proper ergonomic posture during smartphone use by undergraduate students. Few studies on proper posture in the use of smartphones among students suggest the lack of knowledge of proper posture while using the smartphones.[31,32] Hence, this study aimed to evaluate the knowledge and practice of proper ergonomic posture during smartphone use by students in a Nigerian University Medical College.

Materials and Methods

This study used homogeneous convenience sampling to recruit participants. Participants consisted of 231 undergraduate students, drawn from the population of students of a University College of Medicine. The inclusion criteria were participants above 100 levels who had used smartphones for a period of not <2 weeks. The exclusion criteria were undergraduate students who use their smartphone only for making and receiving calls. Ethical approval was sought and obtained from the Health Research and Ethics Committee of the University Teaching Hospital while informed consent was obtained from the participants.

A six man focus group was set up to modify the knowledge, attitude and practice questionnaires used in previous studies,[29-32] and adapt it to a Knowledge and Practice questionnaire which suit the current study and environment. The modified questionnaire has four sections with a total of 21 questions: Section A, collected the sociodemographic data of participants; Section B, collected information on the smartphone use of participants. Questions were asked to determine the type and size of smartphone used, the time and duration of smartphone use per day as well as the functions and applications used; Section C, asked participants about their choice of assumed pictorial postures in standing and sitting from which information on the knowledge of proper ergonomic posture during smartphone use was collected. Good knowledge is indicated when a participant chose the right posture while using the smartphone in standing and sitting, whereas poor knowledge is indicated when a participant chose the wrong posture while using the smartphone in standing and sitting; Section D, collected information on the practice of proper ergonomic posture during smartphone use and the information showing the least comfortable posture for participants. Participants were asked yes/no questions on practice of proper ergonomic posture during smartphone use with Yes indicating 'Good Practice' and No indicating 'Poor Practice.'

Copies of the questionnaire were distributed by hand in classes and hostels, to students of different departments in the university college of medicine who fell within the inclusion criteria. The total number of participants in each department was first determined before questionnaire distribution, in order to know the exact amount of participants needed in each department. The questionnaires were explained by the researcher to the participants at the point of distribution after which they were instructed to complete the questionnaire in the absence of the researcher and then retrieved within 24 h.

Data were collated and analysed using the Statistical Package for the Social Sciences software version 17 (SPSS Inc. Chicago, Illinois, USA). Descriptive statistics of mean, standard deviation and percentages were used to summarise the sociodemographic characteristics of participants. Chi-square was used to test the strength of association between the practice of proper posture and time spent using the smartphones.

Results

Out of the 235 structured questionnaires distributed, 231 were returned adequate for the analysis (a response rate of 98.3%). The mean age of the respondents was 19.8 ± 2.5 years. Majority of the respondents 147 (63.6%) were within the age group of 17–20 years. The female students were more 141 (61.0%) than the males 90 (39.0%). Most of the respondents 227 (98.3%) were single [Table 1].

Majority of the respondents 197 (85.3%) used the android smartphones, 23 (10.0%) used iPhone, while only 4 (1.7%) used the Windows phone. Seventy-three (31.6%) of the respondents have been using their smartphones for about 1–6 months, whereas 57 (24.7%) have been using their smartphones for 6–12 months. Very few respondents 67 (29.0%) have more than one smartphones. Majority of the respondents 159 (68.8%) used their phone mostly at night, followed by afternoon 58 (25.1%). Only 14 (6.1%) use their phone in the morning [Tables 2 and 3]. Majority (66, 28.6%) of the respondents used their phones for 4–6 h daily, followed by 64 (27.7%) who used their phones for more than 12 h daily. Only 11 (4.8%) used their phones for <1 h daily [Figure 1].

Respondents' knowledge on proper standing, sitting and wrist ergonomic posture during smartphone usage showed some variations among users [Table 4]. Majority of the respondents 124 (56.7%) have poor knowledge of proper standing ergonomic posture, whereas 107 (46.3%) have good knowledge. Similarly, majority of the respondents 194 (84.0%) have poor knowledge of proper sitting ergonomic posture, whereas 37 (16.0%) have good knowledge. Furthermore, majority of the respondents 149 (64.5%) have poor knowledge of proper wrist ergonomic posture, whereas 82 (35.5%) have good knowledge.

Majority of the respondents, 54.72%, do not have good practice of proper ergonomic posture when using the smartphone, whereas only 45.28% practice the proper ergonomic posture during smartphone use [Figure 2]. Furthermore, majority of the respondents 201 (87.0%) agreed that there are risk factors associated with smartphone use, 16 (6.9) did not agree, while 14 (6.1) were not sure. In the same vein, 119 (83.5%) agreed that the risk factors could be prevented, 15 (65%) did not agree, while 23 (10.0%) stated they were not sure. Whereas 192 (83.1%) stated that modifying posture and increasing movement was important in reducing risk factors, 6 (2.6) disagreed and 33 (14.3) were unsure.

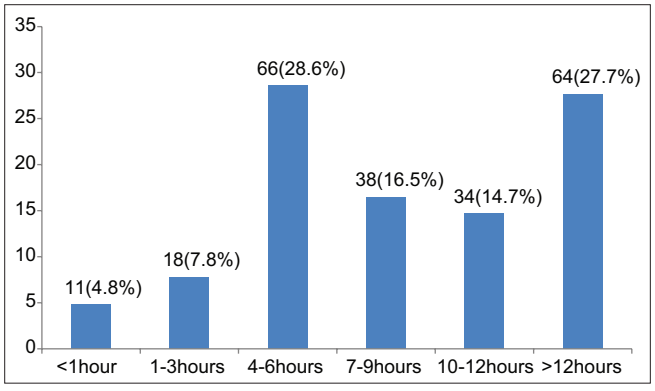

Figure 1: Daily duration of smartphone usage by respondents

Table 1: Sociodemographic characteristics of respondents

Variables	Frequency, *n* (%)
Age (years)	
17-20	147 (63.6)
21-25	75 (32.5)
26-30	9 (3.9)
Total	231 (100.0)
Sex	
Male	90 (39.0)
Female	141 (61.0)
Total	231 (100.0)
Marital status	
Single	227 (98.3)
Married	1 (0.4)
Cohabiting	3 (1.3)
Total	231 (100.0)

Table 2: Respondents smartphone characteristics and usage

Variables	Frequency, *n* (%)
Type of smartphone used	
Android	197 (85.3)
iPhone	23 (10.0)
Windows	4 (1.7)
Others	7 (3.0)
Total	231 (100.0)
Size of android smartphones	
4	7 (3.0)
4.5	16 (6.9)
5	46 (19.9)
5.5	44 (19.0)
5.7	10 (4.3)
6	21 (9.1)
Not sure	87 (37.7)
Total	231 (100.0)
Usage of other smartphones	
Yes	67 (29.0)
No	164 (71.0)
Total	231 (100.0)
Size of other smartphone	
4	10 (4.3)
4.5	11 (4.8)
5	12 (5.2)
5.5	4 (1.7)
5.7	2 (0.9)
6	2 (0.9)
Not sure	26 (11.3)
Nil	164 (71.0)
Total	231 (100.0)

Table 3: Smartphone time usage among respondents

Variables	Frequency, *n* (%)
Duration of smartphone use	
2-3 weeks	15 (6.5)
1-6 months	73 (31.6)
6-12 months	43 (18.6)
12-18 months	57 (24.7)
18-24 months	17 (7.4)
>24 months	26 (11.3)
Total	231 (100.0)
Time of the day smartphone is mostly used	
Morning	14 (6.1)
Afternoon	58 (25.1)
Night	159 (68.8)
Total	231 (100.0)

Table 4: Respondents knowledge of proper ergonomic posture during Smartphone use

Variables	Frequency (%)
Standing	
A	107 (46.3)
B	64 (27.7)
C	42 (18.2)
D	15 (6.5)
E	3 (1.3)
Total	231 (100.0)
Sitting	
A	37 (16.0)
B	82 (35.5)
C	37 (16.0)
D	21 (9.1)
E	11 (4.8)
F	43 (18.6)
Total	231 (100.0)
Posture of the wrist and fingers	
A	82 (35.5)
B	33 (14.3)
C	20 (8.7)
D	80 (34.6)
E	16 (6.9)
Total	231 (100.0)

Key: Correct posture (A); Variants of awkward postures (B, C, D, E)

One hundred and twenty-five (54.1%) of the respondents stated that in standing, their neck is not kept vertical and relaxed and head is not upright, while 68 (29.4%) stated that their neck is kept vertical and relaxed. In contrast, 105 (45.5%) stated that they avoid bending forward and to the side, while 96 (41.6%) of the respondents stated that they do not avoid bending forward and to the side. Ninety-two (39.8%) of the respondents stated that their elbow remains below the chest level, whereas 80 (34.6%) said the elbow is not below the chest level. Majority of the respondents 121 (52.4%) stated that in sitting, prolonged bent posture of the lower back and neck (more than 30 min) is avoided. Most of the respondents said they sit with back support while using the smart phone while 43 (18.6%) said they do not [Table 5].

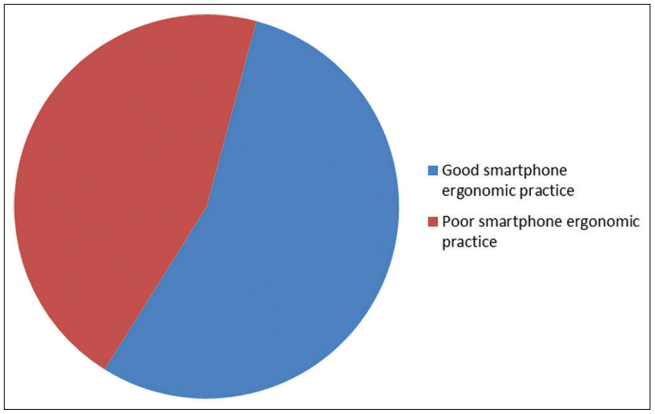

Figure 2: Respondents ergonomic practice

Discussion

This study determined the knowledge and practice of proper ergonomic posture during smartphone use by undergraduate students in a University College of Medicine. All respondents owned a smartphone with about 29% having more than one smartphones. This agrees with previous report that smartphone ownership is highest among young people.[33] Furthermore, this study found that undergraduate students use their smartphones frequently. Majority use their smartphones for either about 4–6 h daily or more than 12 h a day. This finding is a pointer that majority of the respondents are addicted to their smartphones. This was previously adduced that increasing frequency and time spent on smartphones is closely related to the severity of smartphone addiction.[34] Furthermore, long duration of improper posture has been reported to contribute to repetitive injuries.[35]

The findings of this study also show that more than half of the undergraduate students in the medical college are not knowledgeable on proper ergonomic posture to assume when using their smartphones. This agrees with previous findings that for majority of students there is a lack of knowledge regarding good posture to assume during smartphone use.[16,31,32] Knowledge of ergonomics is required to assist smartphone users to avoid certain risk factors that can contribute to the development of musculoskeletal disorders. Good knowledge of the proper ergonomic posture of smartphone would include knowledge on the best posture to assume in different positions.

When asked what the proper ergonomic posture in standing was, about half of the respondents chose the correct posture alluding that some respondents are aware of the proper posture to assume in standing. However, when tested on the knowledge of proper posture in sitting, majority of the respondents chose the awkward postures. Awkward posture such as prolonged head flexion while using a smartphone has been reported as a risk factor for pain symptoms in the neck.[14] Furthermore, majority of the respondents acknowledged that risk factors of

Table 5: Association between respondents practice of proper posture and time spent using the smartphones

Activity	Yes, *n* (%)	No, *n* (%)	Not sure, *n* (%)
Head and neck vertical and upright	68 (29.4)	125 (54.1)	38 (16.5)
Avoiding bending forward and to the side	105 (45.5)	96 (41.6)	30 (13.0)
Elbow below chest level	92 (39.8)	80 (34.6)	59 (25.5)
Avoiding prolonged bent posture in sitting	121 (52.4)	72 (31.2)	38 (16.5)
Sitting with back support	138 (59.7)	43 (18.6)	50 (21.6)

awkward posture can be prevented. Thus, it can be deduced that their choice of awkward posture might be due to negligence or individual perceived positions of comfort. A possible implication of this result is that it may lead to increased risk of musculoskeletal disorders in the upper limb, back and neck.

This study also proves that the head and neck for most respondents is not kept in an upright, vertical and relaxed posture. This correlates with previous studies that smartphone device users frequently adopt a flexed head posture while looking down at the screens of the mobile devices.[13,36-38] A possible explanation for this is that smartphone users tend to feel more comfortable placing their smartphones below chest level, in order to look at the smartphones in this position, the angle at which the neck is tilted downwards would have to increase. This corresponds with the result that more than one-third of respondents agreed that they place their elbow below chest level while using their smartphones. Summarily, participants in this study do not practice proper ergonomic postures in standing and sitting while using their smartphones.

Conclusion

Undergraduate students in this university college of medicine do not possess good knowledge or practice of proper ergonomic posture during smartphone use. Furthermore, more than half of the respondents do not practice proper ergonomic posture while using their smartphone.

Recommendations

In order to reduce the risk of musculoskeletal disorders due to smartphone use, education and training of proper ergonomic posture should be implemented. Improvement needs to be made in awareness among undergraduate college students to enlighten them on the proper posture to assume to prevent complications of poor ergonomic posture. Furthermore, smartphone industries should see the need of consulting expert ergonomists for appropriate information in their instructional manual for buyers.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Cole MT, Shelley DJ, Swartz LB, Adeoye BF. Using digital technologies to aid e-learning: A pilot study. In: Effects of Information Capitalism and Globalization on Teaching and Learning. 1st ed. 701 East Chocolate Avenue Suite 200, Hershey, PA 17033: IGI Global; 2014. p. 22-35.
2. Kaufman DM. Safety Update: Tech Ergonomics – Laptops, Tablets and Smartphones; 2016. Available from: https://www.cherrycreekbenefits.com/tech-egronomics-laptops-tablets-and-smartohines. [Last accessed on 2016 Aug 24].
3. International Data Corporation. Strong Demand for Smartphones and hHated Vendoe Competition Characterize the Worldwide Mobile Phone Market at the End of 2012. Press Release; 2013.
4. Pearson. Student Mobile Devices Survey. National Report on College Students. Available from: http://www.pearsoned.com/wp-content/uploads/pearson-student-mobile-device-survey-2013-national-report-on-college-students-public-release.pdf. [Last accessed on 2016 Aug 30].
5. Hanley M. College Students Smartphone Usage Hits 74%; Tablet Ownership at 30%; 2013. Available from: http://th-ebook-s3amazonaws.com/Hanley_bell_state_college_student_cell_phone_study_summary_febuary%202013.pdf. [Last accessed on 2016 Aug 25].
6. Falakai H, Mahajan R, Kandula S, Lymberopoules D, Govindan R, Estrin D. Diversity in Smartphone Usage. In: Proceedings of the 8th International Conference on Mobile Systems Application and Services. San Francisco, California, USA; Association for Computing Machinery Press; 2010. p. 179 94.
7. Acharya JP, Acharya I, Waghrey D. A Study on some of the common health effects of cell-phones amongst college students. J Community Health 2013;3:1-4.
8. Balakrishnan R, Elanchezhian C, Feii T. An extensive usage of hand held devices would lead to musculoskeletal disorder of upper extremity among students in AMU. IJPESH 2016;3:368-72.
9. Ashurst JV, Turco DA, Lieb BE. Tenosynovitis caused by texting: An emerging disease. J Am Osteopath Assoc 2010;110:294-6.
10. Ali M, Asim M, Danish SH, Ahmad F, Iqbal A, Hasan SD. Frequency of De Quervain's tenosynovitis and its association with SMS texting. Muscles Ligaments Tendons J 2014;4:74-8.
11. Adams C. What is Texting Thumb: An Explanation on Repetitive Stress Injury Known as Texting Thumb; 2016. Available from: http://egronomics.about.com/od/dequerveins_syndrome/a/what_is_texting_thumb.htm. [Last accessed on 2021 Mar 06].
12. Berolo S, Wells RP, Amick BC 3rd. Musculoskeletal symptoms among mobile hand-held device users and their relationship to device use: A preliminary study in a Canadian university population. Appl Ergon 2011;42:371-8.
13. Gupta VK, Arora S, Gupta M. Computer related illness and facebook syndrome: What are they and how do we tackle them. Med Update 2013;23:676-9.
14. Lee S, Kang H, Shin G. Head flexion angle while using a smartphone. Ergonomics 2015;58:220-6.
15. Middlesworth M. Fundamental Ergonomics Principles for better Work Performance; 2016. Available from: http://ergo-plus.com/fundamental-egronomic-principles/. [Last accessed on 2016 Aug 22].
16. Hansraj KK. Assessment of stress in the cervical spine caused by posture and position of the head. Surg Technol Inter 2014;25:277-9.
17. Fishman D. Text Neck: A Global Epidemic; 2015. Available from: https://www.coalcreekpt.com/textingneck. [Last accessed on 2016 Aug 24].
18. Vate-U-lan P. Text Neck Epidemic: A Growing Problem for Smartphone Users in Thailand. Twelfth International Conference on E-Learning for Knowledge Based Study; 2015.
19. Can S, Karaca A. Determination of musculoskeletal system pain, physical activity intensity, and prolonged sitting of university students.

Biomed Human Kin 2019;11:28-35.
20. Foley LS, Maddison R, Jiang Y, Marsh S, Olds T, Ridley K. Presleep activities and time of sleep onset in children. Pediatrics 2013;131:276-82.
21. Hallowell EM, Ratey JJ. Delivered from Distraction: Getting the Most out of Life with Attention Deficit Disorder. Ballantyne book trade paperback edition. New York: Ballantyne Books; 2017. p. 4-20.
22. Fowler JS, Volkow ND, Kassed CA, Chang L. Imaging the addicted human brain. Sci Pract Perspect 2007;3:4-16.
23. De-Sola Gutiérrez J, Rodríguez de Fonseca F, Rubio G. Cell-phone addiction: A review. Front Psychiatry 2016;7:175.
24. Weinstein A, Lejoyeux M. New developments on the neurobiological and pharmaco-genetic mechanisms underlying internet and videogame addiction. Am J Addict 2015;24:117-25.
25. Davies N, Hilber T. Nomophobia: Is smartphone addiction a genuine risk for mobile learning? In: 13th International Conference Mobile Learning. Budapest, Hungary: International Association for Development of the Information Society; 2017;13:100-4.
26. Roslizawati N, Farahin II. Ergonomic risks on smartphone addiction among university students. In: 3rd International Conference for Innovation in Biomedical Engineering and Life Sciences. Kuala Lumpur, Malaysia: IFMBE Proceedings, 2021;81:p. 111-7.
27. Anderson L, Heyne LA. Therapeutic Recreation Practice: A Strengths Approach. 1st ed. State College: Venture Publishing; 2012. p. 82-5.
28. Kim Y, Kang M, Kim J, Jang J, Oh J. Influence of the duration of smartphone usage on flexion angles of the cervical and lumbar spine and on deposition error in the cervical spine. Phys Ther Korea 2013;20:10-7.
29. Australian Physiotherapy Association. Mobile Phone Ergonomics. Available from: htpps://www.physioadvisor.com.au/health/ergonomics/mobile-phone-ergonomics/. [Last accessed on 2016 Aug 24].
30. Dimberg L, Laestadius JG, Ross S, Dimberg I. The changing face of office ergonomics. Ergon Open J 2015;8:38-56.
31. Occupational Safety and Health Association, OSHA. Ergonomics the Study of Work; 2000. Available from: https://www.osha.gov. [Last accessed on 2016 Aug 08].
32. SECAmb Display Screen Equipment Self Assessment form. Display Screen Equipment (dse) Workstation Self-Assessment; 2005. Available from: http://www.hse.gov.uk/pubns/indg36.pdf. [Last accessed on 2017 Apr 06].
33. Ovako Working Posture Assessment; 2009. Available from: http://www.ttl.fi/workloadexposuremethods. [Last accessed on 2017 Aug 04].
34. Kwon M, Lee JY, Won WY, Park JW, Min JA, Hahn C, *et al*. Development and validation of a smartphone addiction scale (SAS). PLoS One 2013;8:e56936.
35. Zickuhr K. Tablet Ownership 2013; 2013. Available from: http://pewinternet.org/Reports/2013/Tablet-Ownership-2013.asp. [Last accessed on 2017 Aug 13].
36. Lin YH, Lee YH, Lin PH, Lin SH, Chang LR, Tseng HW, *et al*. Time distortion associated with smartphone addiction: Identifying smartphone addiction via a mobile application. Psychiatry Res 2015;65:139-45.
37. Rakhshaan K, Rehana R, Ambreen S, Umar A. Knowledge and practices of ergonomics in computer users. J Pak Med Assoc 2009;62:213-7.
38. Hussain HM, Khanzada SR, Khan K, Memon AUR, Feroz J, Ali SZ, *et al.* Awareness of good posture and computer ergonomics among medical students of ISRA university. Int J Physiother 2015;2:987-99.