Original Research Article

Correlation of smartphone addiction with musculoskeletal discomfort and neck disability among college students

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ABSTRACT

Background: The nearly universal availability of smartphones in present cultures has resulted in smartphone addiction. The main purpose of the study was to assess risk of musculoskeletal discomfort and neck disability among college students who are smartphone addicted and assumes faulty posture with prolong smartphone use.
Methods: The study examined 100 healthy students of a college in Ahmedabad and Gandhinagar by random sampling based on self-administered questionnaires that consist of Smartphone addiction scale (SAS), Cornell musculoskeletal discomfort questionnaire (CMDQ), Neck disability index (NDI) in the age group of 18-25 years. Pearson correlation coefficient was used to correlate between SAS and CMDQ, and SAS and NDI.
Results: There was a predominance of females over males (females- 78, males- 22). Mean±SD of SAS, NDI and CMDQ was 92.74±21.33. 8.6±9.56 and 88±14.84 (CMDQ frequency), 30.5±7.77 (CMDQ discomfort), 27±4.24 (CMDQ interference) respectively. Pearson correlation coefficient showed a significant moderate positive correlation between SAS and NDI (r=0.44) and it showed a significant moderate positive correlation between both SAS and CMDQ (frequency) (r=0.50) and SAS and CMDQ (discomfort) (r=0.40), while it showed weak correlation between SAS and CMDQ (interference) (r=0.38).
Conclusions: The study indicated that there was a moderate positive correlation between neck disability and Smartphone addiction, while there was mild to moderate correlation between musculoskeletal disorders and smartphone addiction.

Keywords: Smartphone addiction, Neck disability, Musculoskeletal discomfort

INTRODUCTION

Smartphone is a popular device that can perform complicated tasks, which typically have a touchscreen interface, internet access, social network, and gaming application (apps). Mobilephones are considered to be the most popular portable electronic device nowadays. Recent estimates showed that at least 77% of the world's population has their own mobile phone.[1] Among the general population, students are especially sensitive to social media and smart phones because of their pervasiveness.[2] In today's world, where the mobile technology has advanced so much, there are more and more people who are spending an increased amount of time on handheld devices, such as smartphone. The statistic shows the total number of mobile phone users worldwide passed the five billion mark by 2019.[3]

Most smartphone tasks users require to stare sharply downwards or to hold their arms out in front of them to read the screen which makes their head move forward and cause an excessive anterior curve in the lower cervical vertebrae and an excessive posterior curve in the upper thoracic vertebrae to maintain balance, placing stresses on the cervical spine and the neck muscles. Forward head posture is one of the most commonly recognized poor postures in the sagittal plane.[4] Smartphone addiction, sometimes colloquially known as- nomophobia (fear of being without a mobile phone), is often fueled by an internet overuse problem or internet addiction disorder. In

India, the study reveals that about 19.4% of males and 11.1% of female students had high mobile dependence. Problematic mobile phone use dependency is associated with repercussions such as shorter sleep duration, lower sleep quality with several negative outcomes, Headache and lethargy.[5]

Continuous repetitive movements with the thumb and fingers along with awkward and faulty postures during prolong smartphone use have all been identified as risk factors which may lead to musculoskeletal disorders. The incidence of musculoskeletal disorders (MSD) of hand, wrist, forearm, arm and neck has been increasing all over the world due to prolonged, forceful, low amplitude, repetitive use of hand-held devices (HHD).[6]

With the growing use of smartphones, concerns have increased globally about musculoskeletal problems associated with the prolonged use of smartphones. The aim of the study is assessing risk of musculoskeletal discomfort and neck disability among college students who are smartphone addicted and assumes faulty posture with prolong smartphone use. By early detection of the musculoskeletal symptoms, further deterioration of the musculoskeletal conditions and neck disability can be prevented. Hence, there is tremendous need to assess the risk of smartphone addiction and its correlation with neck disability and musculoskeletal discomfort in college students.

METHODS

Participants were healthy college students from Ahmedabad and Gandhinagar. To be included in the study their age group should be of 18-25 years with minimum smartphone use of ≥1 hour per day, and able to understand and fill the questionnaire in English. Exclusion criteria were students with any other medical cause, musculoskeletal injury and neurological illness.

Study design was observational study with random sampling where total estimated sample included 100 subjects. The period for data collection in the study was 3 months from January to March 2021.

The permission of subject was taken priorly in form of consent form. Whole research purpose and procedure was explained to the students. Then the data was collected using a questionnaire-based survey from willing students who were studying in colleges who met the inclusion and Exclusion criteria.

Research instrument used was the google form named 'Correlation of smartphone addiction with musculoskeletal discomfort and neck disability among college students'.

The google form consisted of 4 parts including- (1) demographics (name, age, gender, height, weight) and hours of mobile usage per day; (2) Smartphone addiction scale (SAS); (3) Neck disability index (NDI); and (4) Cornell musculoskeletal discomfort questionnaire (CMDQ).

Smartphone addiction scale

The SAS is a self-reporting scale to assess smartphone addiction. It consists of six factors and 33 items, with a six-point Likert scale (1: 'strongly disagree' to 6: 'strongly agree'). The six factors were daily-life disturbance, positive anticipation, withdrawal, cyberspace-orientated relationship, overuse and tolerance. The respondent marks the statement which most closely describes their smartphone use characteristics. Scores range from 32 to 132. The higher the score, the greater the degree of pathological use of the smartphone. The SAS is a reliable and valid measurement tool for the evaluation of smartphone addiction.[8]

Neck disability index

The NDI (modification of the Oswestry low back pain disability index) is patient-completed, condition-specific functional status questionnaire with 10 items including pain, personal care, lifting, reading, headaches, concentration, work, driving, sleeping and recreation. Each section is scored on a 0 to 5 rating scale, in which zero means 'no pain' and 5 means 'worst imaginable pain'. The test was interpreted as a raw score, with a maximum score of 50. A higher NDI score indicates greater neck disability. This index is the most widely used and most strongly validated instrument for assessing self-rated disability in patients with neck pain.[9]

Cornell musculoskeltal discomfort questionnaire

The CMDQ is a 54-items questionnaire containing a body map diagram and questions about the- (1) prevalence of musculoskeletal pain; (2) discomfort; and (3) interference with work, during the previous week in 20 regions of the body. Total discomfort score was calculated by using the following formula: frequency+discomfort+interference, where higher the scores indicated more discomfort. The validity has been extensively tested by Dr. Oguzhan Erdinc in Turkey with good results.[10]

Statistical analysis

Data analysis was done through Microsoft Excel by Microsoft Windows. The numerical scores of SAS, NDI and CHDQ were presented as mean±Standard deviation. Pearson correlation coefficient was used to assess the relationship between SAS and NDI and SAS and CMDQ scores.

RESULTS

The sample composed of 100 participants (age mean±SD= 21.22±1.20), 78% were females and 22% were males with maximum people having usage hours of 5 hours per day.
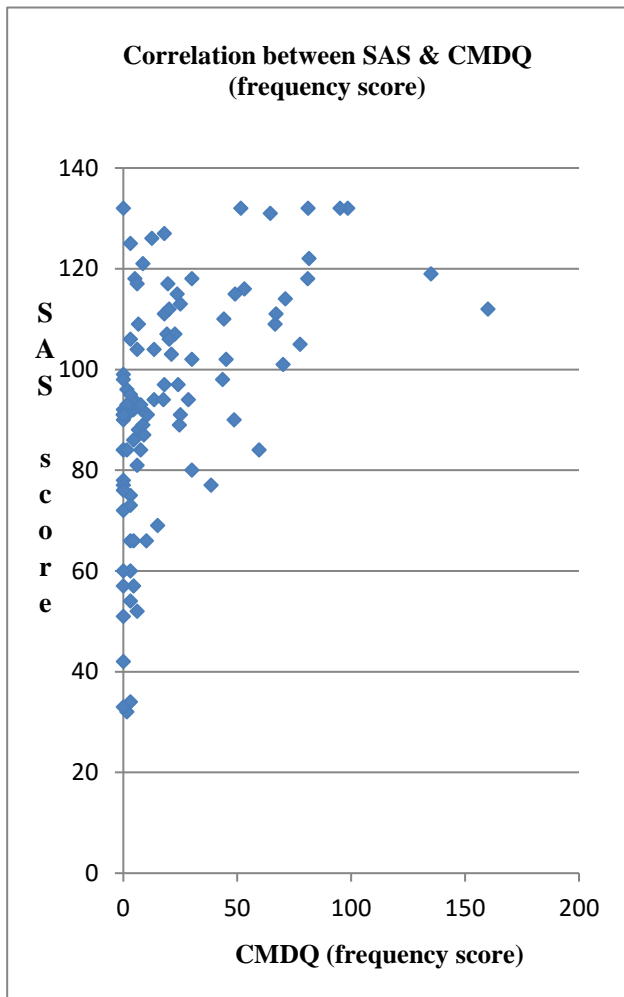
Pearson correlation coefficient showed a significant moderate positive correlation between SAS and NDI ($r=0.44$) and it showed a significant moderate positive correlation between both SAS and CMDQ (frequency) ($r=0.50$) and SAS and CMDQ (discomfort) ($r=0.40$), while it showed weak correlation between SAS and CMDQ (interference) ($r=0.38$).

The correlation between SAS and CMDQ is shown in Figure 1, 2 and 3 and correlation between SAS and NDI is shown in Figure 4. Mean±standard deviation of SAS, NDI and CMDQ are shown in Table 1.
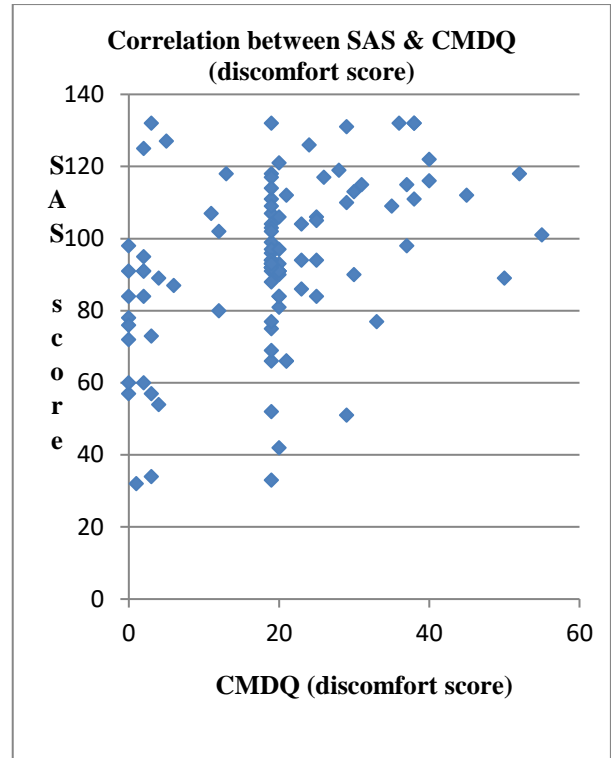
Table 1: Mean±SD of outcome measures.

| Outcome measures	Mean±SD
SAS[a]	92.74±21.33
CMDQ[b] (frequency)	88±14.84
CMDQ[b] (discomfort)	30.5±7.77
CMDQ[b] (interference)	27.37±4.24
NDI[c]	8.6±9.56

Note: [a]Smartphone addiction sale; [b]Cornell musculoskeletal discomfort questionnaire; [c]Neck disability index.

Figure 2: Correlation between Smartphone addiction scale and Cornell musculoskeletal discomfort questionnaire (discomfort score) (r=0.40).
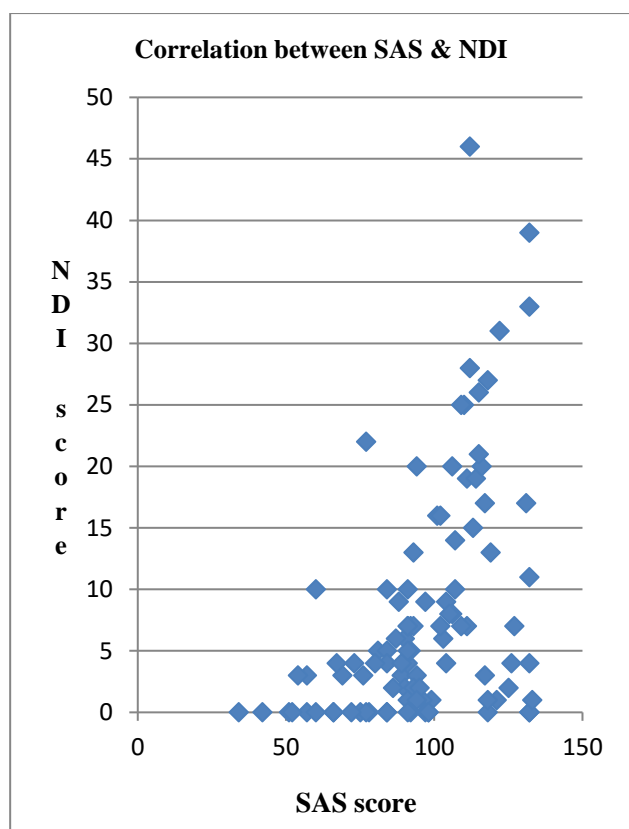

Figure 1: Correlation between Smartphone addiction scale and Cornell musculoskeletal discomfort questionnaire (frequency score) (r=0.50).
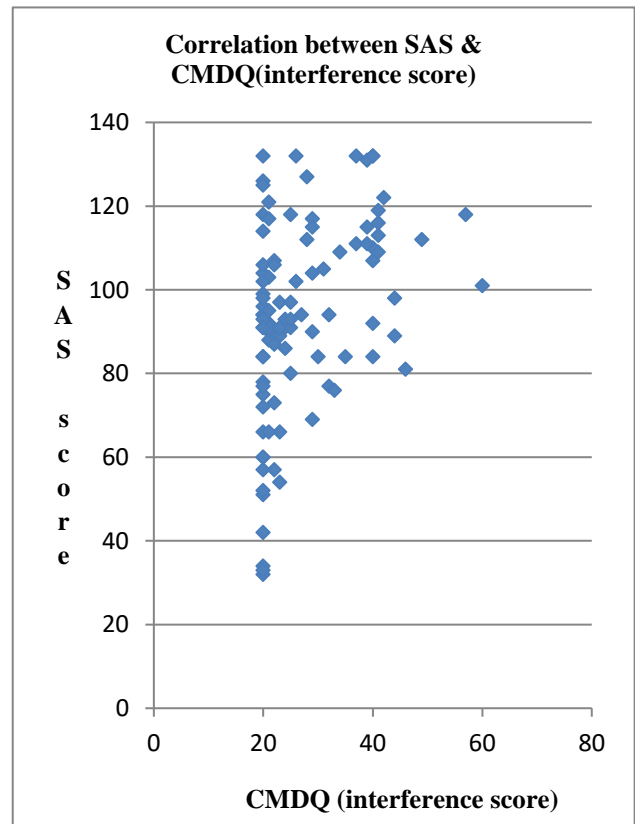
Figure 3: Correlation between Smartphone addiction scale and Cornell musculoskeletal discomfort questionnaire (r=0.38).

Figure 4: Correlation between Smartphone addiction scale and Neck disability index (r=0.44).

DISCUSSION

In the present study most, participants used their smartphone more than 2 hours. So, they are slightly more prone to get higher score in Smartphone addiction scale. Average score of the SAS scale is 92.74. So, we can say that most of the students are Smartphone addicted. Our results in the present study showed that that the degree of smartphone addiction was significantly correlated with musculoskeletal discomfort in the participants. Significant moderate positive correlation between both SAS and NDI and between SAS and CMDQ.

The neck disability among smartphone users might be related to frequent neck flexion posture, which changes the natural curve of the cervical spine and increases the amount of stress on the cervical spine, leading to irritation and spasm in the surrounding skeletal structures and ligaments.[4] Excessive use of smartphones can lead to habitual repetitive and continuous movements of the head and neck toward the screen throughout the day. Such movements are associated with a high risk of chronic neck pain and may explain the strong association between SAS and NDI scores in the present study.[4]

Furthermore, since smartphone users in their teens and twenties commonly use their smartphones more than the elderly do, they are vulnerable to having severe musculoskeletal disorders, the symptoms of which can include fatigue and pains in the upper extremities, such as the neck, shoulders, arms, wrists, back of the hand, and fingers, in addition to pain in the waist.[2] The user's static repeated motion reduces blood circulation, prevents nutrients from being supplied to muscles, and causes small amounts of fatigue and pain. The musculoskeletal disorders that often occur are caused by repeated motions and by the phone user's minimal muscle tension caused by long hours of exposure.[2] In addition, poor postures lead to fatigue, which can have negative effects, such as reduced physiological function, disruption of the autonomic nervous system, creation of problems in daily life, and affects on both the visual and the musculoskeletal systems, leading to headaches and stress.[2]

Shah et al concluded that musculoskeletal problems in neck and hand (predominantly the thumb) can be seen in smartphone addicted students which may be short term initially but may later lead to long term disability. It strongly supports the current study.[11] Hakala et al also reported that frequent use of mobile phones increases the risk of neck-shoulder and lower back pain in adolescents.[12]

Lee et al stated that smartphone operation could cause upper extremity pain.[13] However, Karthikeyan et al concluded that smartphone addiction has no effect on craniovertebral angle but could negatively affect a person's depression status.[14]

Abdulwahab et al has found a positive correlation between addiction to Smartphone use and various degrees of neck problems among the participants.[4]

The future implications of the present study are such that students should spend less time on a smartphone. Students should maintain good posture while using smartphone as well as get guidance on ergonomics on finding any musculoskeletal discomfort in the body. The study had limitations. Self-administered questionnaires do increase the risk of response bias and male female ratio of the sample was not equal. Data was collected from small sample size; further study needs to be done that presents the whole population.

CONCLUSION

To conclude, the present study indicated that there was a moderate positive correlation between neck disability and Smartphone addiction and it also showed that there is mild to moderate correlation between musculoskeletal disorders and Smartphone addiction, which may be short term initially but may later lead to long term disability.

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