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Original Research Article

Correlation of smartphone use addiction with text neck syndrome and SMS thumb in physiotherapy students

Priyal P. Shah*, Megha S. Sheth

SBB College of Physiotherapy, VS Hospital Campus, Ahmedabad, Gujarat, India

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***Correspondence:**
Dr. Priyal P. Shah,
E-mail: priyalshah0410@gmail.com

ABSTRACT

Background: Young adults have grown up today with mobile phones as an evident part of their lives. Text neck syndrome and SMS thumb may occur due to repetitive use of hand held devices (HHDs) resulting in repetitive stress injury or an overuse syndrome while using their mobile phones or other electronic devices for prolonged periods of time. Our aim is to assess self reported addiction to smartphone use and correlate its use and musculoskeletal disorders (MSDs) in neck and hand in young healthy adults.
Methods: The study examined 100 healthy physiotherapy students of a college in Ahmedabad by random table sampling, in the age group of 20-25 years. Students were asked to fill a proforma with the questionnaires of Smartphone Addiction Scale (SAS), Neck Disability Index (NDI), and Cornell Hand Discomfort Questionnaire (CHDQ) attached. Level of significance was kept at 5%. Spearman correlation coefficient was used to correlate between the SAS and NDI, and SAS and CHDQ respectively.
Results: There was a predominance of females over males (females-76, males-24). Mean±SD of SAS, NDI and CHDQ was 102.49±22.15, 30±0.10 and 6.12±8.73 respectively. Spearman correlation coefficient showed a significant moderate positive correlation between both SAS and NDI ($r=0.671$, $p<0.001$) and between SAS and CHDQ ($r=0.465$, $p<0.001$).
Conclusions: The study showed that musculoskeletal problems in neck and hand(predominantly thumb) can be seen in smartphone addicted students which may be short term initially but may later lead to long term disability.

Keywords: Smartphone addiction, Text neck, SMS thumb, Musculoskeletal disorders

INTRODUCTION

A smartphone is the most popular devices used among adolescents. In a study of university students of the United States, text messaging (SMS) was emerged as the most frequently used type of communicative medium.[1]A recent study shows that 79% of the population between the age 18-44 have their cell phones with them almost all the time, with only 2 hours of their walking day spend without their cell in hand.[2]

The term "Text neck" was coined by Dr. Dean L. Fishman, who is a US chiropractor. The term text neck is used to describe a repetitive stress injury or an overuse syndrome where a person has his/her head hung or flexed in a forward position and is bent down looking at his/her mobile or other electronic device for prolonged periods of time. 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, computer, tablets and e-readers. The end result is prolonged flexion of the neck when bent over these electronic devices resulting in the

"text neck" or "turtle neck posture". This condition is a growing health concern and has the potential to affect millions of people all over the world.[2] 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.[3] Incorrect posture of the head and neck has been correlated with chronic musculoskeletal pain.[4]

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). Continuous repetitive movements with the thumb and fingers have all been identified as risk factors which may lead to disorders of the thumb and its musculature like tendinosis of the extensor pollicis longus or myofacial pain syndrome in the hand. Studies have shown a relation between mobile design and anthropometry of the user in causing discomfort and fatigue in hand, elbow and shoulder while using the HHD.[5] Phrases have been coined to describe MSDs due to use of HHDs such as 'SMS thumb', 'iPod finger', 'blackberry thumb', 'wii injury' and 'nintenditis'; however, little evidence exists to support this association.[6,7]

Few studies have been reported about this substantial increase in the number of adolescent smartphone users, having various behavioural effects and its association with musculoskeletal discomfort, in recent years, which is becoming a growing problem and having a large impact globally.

Hence, the aim of the present study was to assess the level of self reported smartphone addiction and correlate its relationship with MSD's in neck as well as in hand in young healthy students.

METHODS

Participants were recruited from SBB College of Physiotherapy, VS Hospital, Ahmedabad. To be included in the study their age group should be of 20-25 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 or a known condition which could lead to pain in the neck or upper limb. In addition, students with neck or upper extremity musculoskeletal trauma or spinal cord injury prior to the study were also excluded. Study design was observational analytical study with random sampling where total estimated sample included 100 subjects. Nature and purpose of the study was explained and informed oral consent was taken from the participants. The period for data collection in the study was from August to November 2017.

The questionnaire were distributed which consisted of 4 parts including, 1) Demographics (Name, age, gender, hand dominance) and hours of mobile usage per day which was classified according to Gustafsson et al, 2) Smartphone Addiction Scale (SAS) to measure self reported addiction to smartphone use, 3) Neck Disability Index (NDI) for any abnormal symptoms of neck functions, and 4) Cornell Hand Discomfort Questionnaire (CHDQ) for abnormal symptoms related to hand functions.[1]

Smartphone addiction scale (SAS)

The SAS is a self-reporting scale to assess smartphone addiction (Kwon et al).[8] 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 circles the statement which most closely describes their smartphone use characteristics. Scores range from 33 to 198. The higher the score, the greater the degree of pathological use of the smartphone (Ching et al).[9] The SAS is a reliable and valid measurement tool for the evaluation of smartphone addiction.[8]

Neck disability index (NDI)

The NDI assessment involves a 10-item, 50-point index questionnaire that assesses the effects of neck pain and symptoms during a range of functional activities.[10] Of the 10 items, four relate to subjective symptoms (pain intensity, headache, concentration, sleeping), four activities of daily living (lifting, work, driving, recreation) and two discretionary activities of daily living (personal care, reading) Each item 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.[10]

Cornell hand discomfort questionnaire (CHDQ)

It is a 6-item questionnaire containing a hand map diagram showing 6 shaded areas of the hand and questions about 1. Prevalence of musculoskeletal pain, 2. Discomfort and 3. Interference with work, during the previous week. Total discomfort score was calculated by using the following formula: frequency × discomfort × interference, where higher the scores indicated more discomfort. Maximum scoring for each area is 90, and the total scoring for 6 areas is 560, (Higher scores showing more discomfort). The validity of the CMDQ has been extensively tested by Dr. Oguzhan Erdinc in Turkey with good results.[11]

Statistical analysis

Data analyses were performed using SPSS 16.0 software for Windows. The numerical scores of SAS, NDI and CHDQ were presented as Mean ± Standard deviation. As the data was not normally distributed, Spearman correlation coefficient was used to assess the relationship between SAS and NDI and SAS and CHDQ scores. The significance level was set at 5%.

RESULTS

The sample composed of 100 participants (Age mean±SD =21.80±1.29), most of whom were females (76/100) with maximum people having usage hours of 2-4 hours per day (46/100). Participant characteristics and smartphone use behaviour are displayed in Table 1.

Table 1: Demographic characteristics of 100 participants.

Hours of phone use/day	No. of participants
1-2 hrs	13
2-4 hrs	46
>4 hrs	41

Table 2: Mean ± Standard Deviation of outcome measures

Outcome measures	Mean±SD
SAS[a]	102.49±22.15
NDI[b]	30±0.10
CHDQ[c]	6.12±8.73

[a]Smartphone addiction scale; [b]Neck disability index; [c]Cornell hand discomfort questionnaire

Mean±standard deviation of SAS, NDI and CHDQ are shown in Table 2.

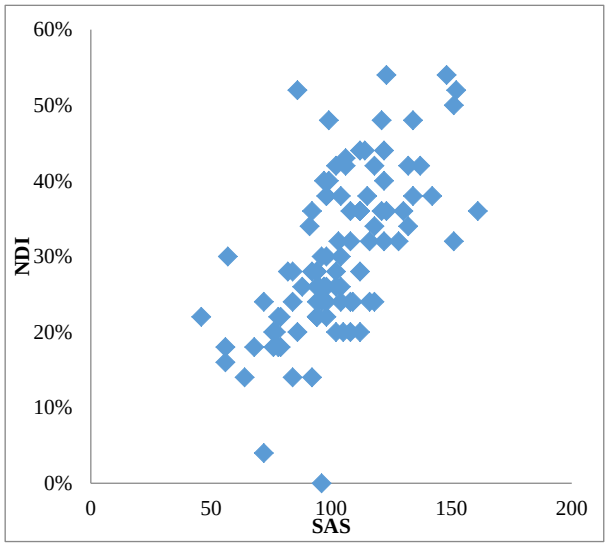

Figure 1: Correlation between smartphone addiction scale and neck disability index (r=0.671*).

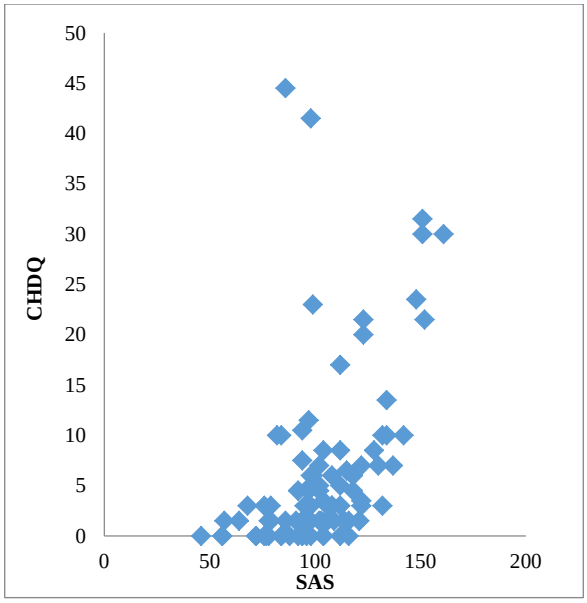

Figure 2: Correlation between smartphone addiction scale and cornell hand discomfort questionnaire (r=0.465*).

Spearman correlation coefficient showed significant positive moderate correlation between SAS and NDI (r=0.671, p<0.001), significant positive moderate correlation between SAS and CHDQ (r=0.465, p<0.001). The correlation between SAS and NDI is shown in Figure 1, and correlation between SAS and CHDQ is shown in Figure 2.

DISCUSSION

Our results in the present study showed that that the degree of smartphone influence was significantly correlated with musculoskeletal discomfort in the participants. Significant moderate positive correlation between both SAS and NDI (p<0.001) and between SAS and CHDQ (p<0.001).

Moreover, SAS showed a higher score- indicating addiction to smartphone use, along with it the scores of NDI showing moderate disability (30-48%-moderate disability), and the CHDQ scores showed maximum scores of shaded areas Area C and E, showing more discomfort in the thumb.[12]

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.[3] 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.[3]

The physical exposure while text messaging on a mobile phone consists of low physical load, repetitive thumb movements and excessive neck flexion.[1] If text neck is left untreated, then it can lead to some serious permanent damage, such as flattening of the spinal curve, early arthritis; spinal misalignment, spinal degeneration or disc compression, disc herniation, or nerve damage.[2]

Text neck most commonly causes neck pain and soreness. In addition, looking down at smart phones too much can lead to upper back pain, also Shoulder pain and tightness ranging from chronic, nagging pain to sharp and severe muscles spasm.[2] Text neck directly affects the spine while flexing the head forward at varying degrees - when the head tilts forward at 15 degrees, the forces on the neck surge to 27 pounds, at 30 degrees 40 pounds, at 450 degrees 49 pounds and at 60 degrees 60 pounds. This issue is a major concern with children; since their heads are larger in relation to their body size than adults, and thus they are have an increased risk for text neck given their propensity to use mobile phones. Serious permanent damage of untreated text neck can be the result and be quite similar to occupational overuse syndrome or repeated stress/strain injury.[2]

Sustained gripping and repetitive movements (especially typing) with the thumb and fingers have all been identified as risk factors which may lead to disorders of the thumb and its musculature, leading to associated syndromes, such as wrist tendinitis or De Quervain's disease. Factors include small spacing in the keyboard, increased static loading and end range motion of the thumb during texting, but the range of movements of the thumb varies according to the mobile size, design and the anthropometry of the user.[7] Studies have revealed that while texting in mobile phone keypad, the thumb covered motions in planes of extension, flexion, abduction-adduction and opposition.[13] This posture of the thumb working near the extreme range of motion is perhaps the main triggering factor for the development of tendinosis of extensor pollicis longus.[7] Studies related to measurement of thumb postures during texting were shown to be affected by the size of the mobile phone and movement axis of the thumb.[14] This might have been a notable factor for developing maximum pain in the thumb areas, as seen in our study. Static loading by holding of the hand held device for long durations, often coupled with hazardous body postures and overuse of the hand muscles are likely contributors to the development of myofascial pain syndrome of hand, forearm, neck and upper back muscles.[15] Symptoms reported in earlier studies also included blistering, paraesthesia and swelling of the thumbs or fingers due to tendinosis and bursitis.[16]

Similar conclusions were given by Eva Gustaffson et al, who showed that the physical exposure while text messaging on a mobile phone consists of low physical load, repetitive thumb movements and excessive neck flexion, causing neck pain and soreness, also concluded prospective associations were found between text messaging on mobile phones and MSDs, implying mostly short term effects, and to lesser extent long term effects on MSDs in neck and upper extremities.[1]

Also, Sharan et al concluded text messaging has an adverse effect on musculoskeletal system of hand in persons who extensively use mobile phone, and different pathologies described were tendinitis of extensor pollicis longus, myofascial pain syndrome of thenar muscles and 1st interossei, De Quervain's syndrome.[19]

Hakala et al also reported that frequent use of mobile phones increases the risk of neck–shoulder and lower back pain in adolescents.[17] Lee et al stated that smartphone operation could cause upper extremity pain.[18] However, Karthikeyan et al concluded that smartphone addiction has no effect on craniovertebral angle but could negatively affect a person's depression status.[19]

The implications of the present study are such that students should make an effort to reduce the continuous amount of time of usage spent using a smartphone, and should also implement other preventive factors like maintenance of correct posture while usage, taking frequent short breaks, and usage of voice to text software could also be advised. Devices promote the predominantly usage of thumb, so users should be advised to habituate themselves by typing or with all the fingers. The study had limitations. Self-administered questionnaires does increase the risk of response bias, and also because data was collected from only one college, and by university students, further study needs to be done on a larger cohort for generalized results, representing the whole population.

So concluding, the present study showed 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. This supports the need for public health educational programmes to inform people especially the students about the physical risks associated with excessive use of smartphones.

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