

# Influence of Smartphone Addiction Grade on Cervical Pain in Young Adults

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**Abstract:** Background: Smartphone usage has increased over the past few years. Due to the internet usage that the smartphone provides, it is extensively used by younger population. Overuse of smartphones is known to cause various musculoskeletal, visual and psychological problems which are an important aspect affecting health and wellbeing of young adults. Thus, this study aimed at assessing the smartphone addiction grades and its influence on cervical pain in young adults.

**Materials and methods:** Young asymptomatic adults (N=60) with 25 males (n=25) and 35 females (35) between the age group of 19-35 years (mean age= 21.85 years) were assessed for smartphone addiction into low, medium and high addiction grades and cervical pain during or immediately after using a smartphone in the past 1 week using the Numerical Rating Scale (NRS).

**Result:** There is a significant difference in the cervical pain in low versus medium smartphone users ( $p=0.0026$ ) and low versus high smartphone users ( $p<0.0001$ ) but no significant difference in neck pain in medium versus high smartphone users ( $p=0.0718$ ).

**Conclusion:** The study concludes that as the smartphone addiction increases, the cervical pain reported by the study population also increased.

**Keywords:** Smartphone, Cervical pain, Numerical rating scale, Young Adults, Smartphone addiction.

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## I. INTRODUCTION

Smartphone is a device that allows sending or receiving calls, text messages, internet browsing, multimedia text messages, games, applications, video conferencing, online surfing, camera, media player, GPS, navigation, Bluetooth, etc.<sup>[1]</sup> The internet usage that a smartphone provides gives additional convenience to the users.<sup>[2]</sup> Smartphone use can result in its addiction which is convergence of existing internet and cellphone addiction adding up.<sup>[3]</sup> The characteristics like usefulness, convenience and accessibility have encouraged dependence on smartphone. Pain is defined as 'unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage'.<sup>[4]</sup>

Studies by Ha et al. revealed excessive use of smartphone have negative effects on human psychology.<sup>[5],[6]</sup> Excessive smartphone use reduced individuals social implication in world and therefore, his/her psychological wellbeing as it produces kind of isolation, loneliness and depression, individual seeks to ease by connecting to internet.<sup>[7]</sup> Thus, they meet their friends less often in person. According to a study by Ha et al. excessive users experienced difficulty in expressing emotions than comparison group. Also, excessive users had higher level of interpersonal anxiety.<sup>[5]</sup>

Thus, the purpose of the study was to assess cervical pain in low, medium and high addiction grades of smartphone users.

## II. MATERIALS AND METHODS

Departmental review was taken before the study was started. The research was conducted at the research lab of K.J. Somaiya College of Physiotherapy. Subjects using a smartphone and in the age group of 19 to 35 years were included in the study. Subjects having any neuromuscular disorder, musculoskeletal disorder affecting the cervical spine, any traumatic condition of the head, cervical spine and shoulder in the past 6 months and any cardiovascular disorder were excluded from the study. A written informed consent was taken from all the subjects. The smartphone addiction scale (SAS)<sup>[8]</sup> was used for classifying the smartphone users into low, medium and high addiction grades. It is a 33 questions questionnaire in which each questions answer was to be marked using Likert scale from 1 to 6. The scoring of the scale is as follows: 33 to 66 low addiction smartphone users, 67 to 132 medium addiction smartphone users and 133 to 198 high addiction smartphone users. 100 subjects were screened and depending upon the scores randomly 20 subjects were selected in each of the groups. Thus, 60 subjects with 25 males and 35 females were assessed in the study. The participants were explained the Numerical Rating Scale (0 to 10) and were asked to report their cervical pain on the Numerical Rating Scale in the past 1 week during or immediately after using a smartphone.

### III. RESULT

The data of 60 participants (N=60) with 25 males (n=25) and 35 females (n=35) in the age group of 19 to 35 years of age (mean=21.85 years) was collected. The data thus collected was statistically analyzed using Graph Pad Prism version 7. The statistical tests used were one-way ANOVA and multiple measure comparison to analyze pain in low, medium and high smartphone addiction users. All tests were performed at 5% significance.

**Table1: Pain in low, medium and high addiction smartphone users**

	MEAN	S.D.	TEST	p-value	LEVEL OF SIGNIFICANCE
LOW (33-66)	0	±0	One-way ANOVA, Multiple measure comparison	Low versus medium p=0.005	Low versus medium is significant
MEDIUM (67-132)	2.15	±1.785	One-way ANOVA, Multiple measure comparison	Medium versus high p=0.1201	Medium versus high is not significant
HIGH (133-198)	3.2	±2.118	One-way ANOVA, Multiple measure comparison	Low versus high p<0.0001	Low versus high is extremely significant

### IV. DISCUSSION

Smartphone use encourages incorrect postures like neck bending posture or hunched postures<sup>[9]</sup> that cause an increase in the weight supported by the cervical spine as the head is flexed. According to a study done by Hansraj et al., weight supported by the spine increases when the head is flexed at different angles i.e. 10-12 pounds in neutral, 27 pounds at 15°, 40 pounds at 30°, 49 pounds at 45°, 60 pounds at 60° and at 90° it is not reliable.<sup>[10]</sup> The increased weight of the head forces the cervical extensors to bear the increased work and they have to contract more forcefully in order to keep the out of balance head from falling into more flexion. The flexor muscles which are supposed to help balance the head by pulling it forward are not required. Thus, habitual postures cause cervical extensors to weaken causing them to atrophy from chronic tightness and spasm squeezing out oxygen and nutrient rich blood starving the muscle. Spasm and tightness invariably cause quite a lot of pain, especially at the extensor area.<sup>[11]</sup> Smartphone tasks require users to stare sharply downwards or hold arms out in front of them to read the screen that makes the head move forward and cause excessive lordosis (anterior curve) in lower cervical vertebrae and excessive kyphosis (posterior curve) in upper thoracic vertebrae to maintain balance that place stress on the cervical spine and the cervical muscles.<sup>[12]</sup> Continuous use of smartphone can cause length-tension relationship alteration in a muscle due to poor posture attained during smartphone use resulting in repetitive microtrauma to the musculoskeletal structures giving rise to pain. Also, in individuals performing repetitive tasks in the use of smartphone low forces pain may be associated with overload of low threshold motor units.<sup>[13],[14]</sup>

Neck pain in turn can cause affection of cervical proprioception which is defined as special type of sensitivity that informs about sensations of deep organs and relationships between muscle, joints, generate afferent information that is crucial to effective and safe performance of motor tasks.<sup>[15],[16]</sup> Due to pain there is change in the muscle fibre types which reduces endurance<sup>[17],[18],[19]</sup> of the cervical muscles specially the craniocervical flexors.<sup>[20]</sup> Due to pain, altered muscle function and altered length-tension relationship, there is compromise of cervical spine stability<sup>[21]</sup> which increases the motion<sup>[22]</sup> and mechanical load<sup>[23]</sup> of the cervical segments. Abnormal loading, decreased endurance, fatigue and pain contribute to a significant deficit in feedforward control of the cervical spine. These could be a contributing factor which can make cervical spine more prone to strain<sup>[24]</sup>. Thus, reporting of significant pain by smartphone users is an alarming factor which could be a precursor to neuromotor dysfunction.

### V. CONCLUSION

As the smartphone addiction increases the cervical pain reported by the patient increases.

## VI. REFERENCES

- [1] [www.difference.between.info/difference-between-smartphone-and-normal-phone](http://www.difference.between.info/difference-between-smartphone-and-normal-phone).
- [2] Kim DS: Biomechanical analysis of a smartphone task with different postures. *Korean J Sport Biomech*, 2012, 22:253-259 [Cross Ref].
- [3] Hwang KH; Yoo YS. Cho OH: Smartphone overuse and upper extremity pain, anxiety, depression and interpersonal relationships among college students. *Korea Constents Association*, 2012, 12; 365-375.
- [4] International Association for the Study of Pain: Pain Definitions doi:10.1016/0304-3959(79)90046-0.PMD 460931
- [5] Ha, J.H; et al., Characteristics of excessive cellular phone use in Korean adolescents. *Cyber Psychology & Behavior*, 2008.11(6): p.783-784.
- [6] Jin, B. and N. Park, Mobile voice communication and loneliness: Cell phone use and the social skills deficit hypothesis: *New Media & Society*, 2013.15(7): p.1097-1111
- [7] Kraut, R., et al., Internet paradox revised. *Journal of social issues*, 2002.58(1): p.49-74.  
[https://www.google.co.in/search?q=smartphone+addiction+scale+questionnaire&sa=X&rlz=1C1CHZL\\_enIN706IN706&tbm=isch&imgil=ODWUCZ\\_qtaaHcM\\$253A%25252Fjournals.plos.org%25252Fplosone%25252Farticle%25253Fid%2525253D10.1371%25252Fjournal.pone.0083558&source=iu&pf=m&fir=ODWUCZ\\_qtaaHcM%253A%252CWNwFUSmvM4E5M%&gws\\_rd=ssl](https://www.google.co.in/search?q=smartphone+addiction+scale+questionnaire&sa=X&rlz=1C1CHZL_enIN706IN706&tbm=isch&imgil=ODWUCZ_qtaaHcM$253A%25252Fjournals.plos.org%25252Fplosone%25252Farticle%25253Fid%2525253D10.1371%25252Fjournal.pone.0083558&source=iu&pf=m&fir=ODWUCZ_qtaaHcM%253A%252CWNwFUSmvM4E5M%&gws_rd=ssl) © 2013 Kwon et al. <https://doi:10.1371/journal.pone.0083558.t001>
- [8] Janwantanakul P, Sitthipornvorakul E, Paksachol A: Risk factors for the onset of nonspecific lowback pain in office workers: a systemic review of prospective cohort studies. *J Manipulative Physical Ther*, 2012, 35:568-577 [MedLine][Cross Ref]
- [9] Hansraj, K.K., Assessment of stresses in the cervical spine caused by posture and position of the head. *Surg Technol Int*, 2014, 25; p.277-9 [www.ncbi.nlm.nih.gov/m/pubmed/25393825/](http://www.ncbi.nlm.nih.gov/m/pubmed/25393825/)
- [10] [www.portobellophysio.ie/bad-posture-causes-neck-pain](http://www.portobellophysio.ie/bad-posture-causes-neck-pain)
- [11] Berolo, Wells & Amick, 2011; Kang et al., 2012.
- [12] Sjøgaard G, Lundberg U, Kadefors R. The role of muscle activity and mental load in the development of pain and degenerative processes at the muscle cell level during computer work. *Eur J Appl Physiol* 2000; 83:99-105.
- [13] Mork PJ, Westgaard RH. Low-amplitude trapezius activity in work and leisure and the relation of shoulder and neck pain. *J Appl Physiol* 2006; 100:1142-1149.
- [14] Smetacek V. Mechner F(2004) Making sense. *Nature* 432:21.
- [15] Stillman BC (2002) Making Sense of Proprioception: The meaning of proprioception, kinaesthesia and related terms. *Physiotherapy* 88:667-676.
- [16] Watson DH, Trott PH. Cervical headache: an investigation of natural head posture and upper cervical flexor muscle performance. *Cephalalgia* 1993; 13:272-284.
- [17] Placzek JD, Pagett BT, Roubal PJ, et al. The influence of the cervical spine on chronic headache in women: a pilot study. *J Manual Manipul Ther* 1999; 7:33-39.
- [18] Treleaven J, Jull G, Atkinson L. Cervical musculoskeletal dysfunction in post-concussional headache. *Cephalalgia* 1994; 14:273-279.
- [19] O'Leary S, Jull G, Kim M, et al. Craniocervical flexor muscle impairment at maximal, moderate and low loads is a feature of neck pain. *Man Ther* 2007; 12:34-39.
- [20] Winters JM, Peles JD. Neck muscle activity and 3D head kinematics during quasistatic and dynamic tracking movements. In: Winters JM, Woo SL-Y (eds) *Multiple Muscle Systems: Biomechanics and Movement Organisation*. New York: Springer-Verlag, 1990:461-480.
- [21] Moore KL, Dalley AF. *Clinically Orientated Anatomy*, 4th ed. Philadelphia: Lippincott Williams and Wilkins, 1999.
- [22] Behrsin JF, Maguire K. Levator scapulae action during shoulder movement. A possible mechanism of shoulder pain of cervical origin. *Aust J Physiother* 1986; 32:101-106.
- [23] Falla D, Jull G, Hodges PW. Feedforward activity of the cervical flexor muscles during voluntary arm movements is delayed in chronic neck pain. *Exp Brain Res* 2004; 157:43-48.