

# The cost of long-term use of smart phones in the form of text neck syndrome; a systematic review

Shamaal Khattak<sup>1</sup>, Mashal Gul<sup>2</sup>, Hoor Ali Kakar<sup>3</sup>, Ghazanfar Ullah<sup>4</sup>, Mujeeb Ur Rahman<sup>5</sup>

## Submitted:

January 11, 2019

## Accepted:

February 14, 2019

## Author Information

<sup>1,2,3,5</sup>KMU Institute of Physical Medicine and Rehabilitation

<sup>4</sup>Rehman College of Rehabilitation Sciences

## Corresponding Author

Shamal Khattak

Institute of Physical Medicine and Rehabilitation

Khyber Medical University, Peshawar

Email: shamaalkhattak@gmail.com

## ABSTRACT

**Introduction:** Text neck syndrome or 'Text neck' refers to pain symptoms on the neck and neighboring regions during or after prolonged looking down posture that smartphone or tablet PC users typically make when they are text messaging. Because of the development of portable information and communication technology, people use phones not only to talk and text but also to play games, listen to music, watch videos, browse the web, send and receive emails and use social media. This review was carried out on the effects of long-term use of smart phones.

**Material & Method:** A literature search using PubMed, Medline and Google scholar was carried out to identify relevant literature. Additional searches were conducted by hand searching. The literature searches were performed in February-March 2017. The initial search terms "text neck" and "smart phone" were used to collect relevant research articles. Those studies were included in the review which were published about the text neck syndrome in young adults with age range of 19-30 years. Studies published from 2013-2016 were included. Studies in languages other than English were excluded.

**Results:** A total of 6 studies fulfilled eligibility criteria. Results showed that 30-degree head flexion angle was associated with lowest fatigue level while head flexion angle above 50 degree was associated with highest fatigue level. 33 degrees to 45 degrees is the average range to use a smartphone measured from vertical. Severe addiction of smartphone use leads to largest errors including impaired proprioception.

**Conclusion:** Chronic use of Smartphone leads to forward head posture, affecting upper cervical muscles and surrounding skeletal structures including ligaments which can lead to spinal deformities.

**Keywords:** Mobile, MSK disorders, Smartphone, Text neck.

The authors declared no conflict of interest and agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All authors contributed substantially to the planning of research, questionnaire design, data collection, data analysis and write-up of the article as part of a student research team at Institute of Physical Medicine and Rehabilitation. The whole process of review was supervised by Dr. Mujeeb Ur Rahman (PT) Assistant Professor Institute of Physical Medicine and Rehabilitation Khyber Medical University, Peshawar.

Citation: Khattak, S., Gul, M., Kakar, HA., Ullah, G., Rahman, M. The cost of long-term use of smart phones in the form of text neck syndrome: A systematic review. *Rehman J Health Sci.* 2019;1(1):3-5

## INTRODUCTION

Text neck syndrome also known as 'Text neck' is a common problem whereas neck pain or its symptoms are felt by an individual following prolonged use of electronic gadgets with screen; smart phone and tablets (1). This problem is increasing day by day due to frequent and prolonged use of smart phones or tablets for academic and recreational activities (2). The use of these devices is becoming necessity rather than luxury due to enhanced capacities of managing variety of academic tasks and software needed by academicians (3). Moreover, these electronic gadgets are usually loaded with gaming software or have the capacity to install gaming software which is usually used by all groups of ages (4). Moreover, with larger memory in these devices, individuals can store other recreation stuff including movies and songs and therefore a big number of individuals travelling in trains and buses might be seen busy with these gadgets (5). It has been reported that the penetration rate of smartphone is increasing day by day and it has exceeded 56% in top 15 countries of the globe. Due to increasing number of their electronic gadgets in the market, a rise in the use of functions associated with these devices might be seen. In the USA, more than 65% of mobile phone users spend more than 20 hours a week by sending emails, text messages or using Facebook and other social network services (2). This shows how much individuals are relying on these electronic devices. It has been observed that with increasing number of smart phone users, health concerns have also

been risen (1, 6). One of these major concerns is 'text neck' which is strongly associated with the use of smart phones (7).

It is obvious from the literature that addiction of smart phone users have exceeded internet addiction (8). It has been reported that the use of smartphone often leads to 'text neck'; however, the posture of these users while performing other activities during a typical day remained unclear (1). The common posture used for using smart phone typically involved holding smart phones with one's hands and with a forward tilt neck. This posture causes an extreme pressure on neck and structures around neck leading to discomfort in the neck region. Recent reports on the effects of use of smart phones have reported the generalized problems of shoulder and thumb rather than limited to neck of patients (2). It seems a reasonable explanation to the latter fact that the use of smartphones is responsible for the poor posture of neck and its related structures. Another important factor which might be considered for having neck problems due to use of smart phones may be the over use of these structures in an imbalance manner where smart phone users continuously focus on the use of specific muscles around the neck (9). Despite the fact the text neck syndrome is becoming an alarming problem, still limited reviews may be found in the literature. Therefore, this systematic review was conducted to present a summary of outcomes of trials carried out on text neck syndrome.

## MATERIALS & METHODS

A literature search using PubMed, Medline and google scholar was carried out to identify relevant literature. Additional searches were conducted by hand searching. The literature searches were performed during February and March, 2017. Keywords were identified based upon the contributing authors' consensus and relevance to the search question. The initial search terms "text neck" and "smart phone" were used to collect relevant research articles. Those studies were included in the review which were published about the text neck syndrome in young adults with age range of 19-30 years published from 2013 to 2016. All studies published other than English language were excluded from this review.

All the selected articles were screened by three authors independently who divided the article into 'acceptable or not acceptable for review' categories. Summary outcomes of the studies were tabulated having information about the authors, date of publication, country/region (where research was conducted), study design, age of study population and measurement tool used for assessment of text neck syndrome. This study did not involve any interaction with humans or publication of confidential patient identifiers. Therefore, this study did not require prior ethical approval. Administrative approval from the Institute of Physical Medicine and Rehabilitation, Khyber Medical University was taken

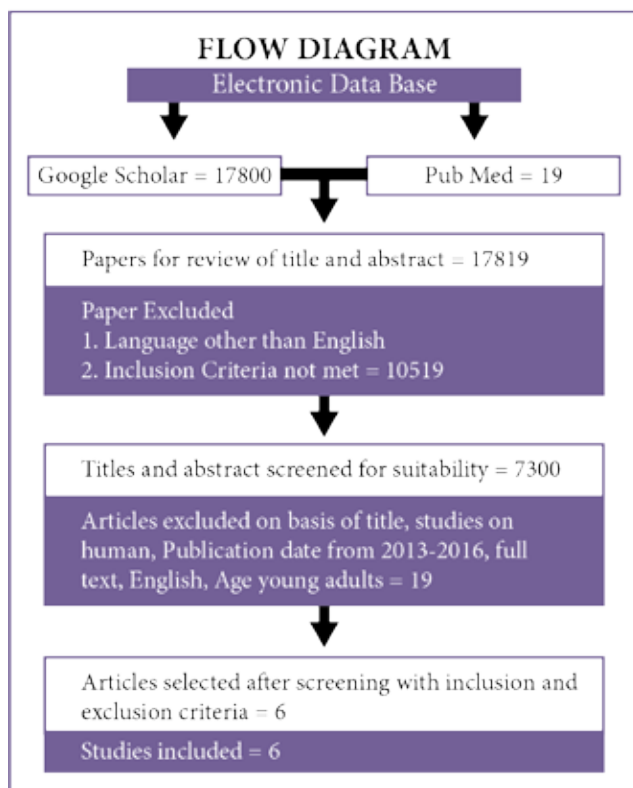


Figure 1: Flow chart diagram of systematic search process

## RESULTS

A total 17819 articles were identified by searching PubMed, Medline and google scholar. Initially 10519 articles were excluded when the keywords 'smart phone' and 'text neck syndrome' were applied. Upon screening for exclusion criteria 7300 articles were left. Exclusion was on the basis of screening with inclusion and exclusion criteria. After application of desired filters; studies on human, publication date from 2013 to 2016 and age of 19 to 30 years (young adults), the number of studies left to review was 19. They were screened further and studies

specifically on neck and the use of smartphones were selected for final review, which resulted in inclusion of 6 studies.

In one of the included studies, use of smartphone for the purposes of texting, internet usage or watching online videos, it was observed that the neck of than half of the population (n=9) remained more between 33-45 from vertical angle. Their head flexion angle remained worst during sending text messages (37.28 to 46.88), followed by using internet (33.48-42.58) and then watching online videos. This indicate that neck remained on more compromised position during texting compared to other activities carried out by the smart phone users and, therefore, texting might be regarded one of the important factors causing neck text syndrome in general population. It is important to mention that differences in these mentioned angles were observed when participants kept on changing their standing posture to sitting or any other posture. In comparison between sitting and standing postures, sitting remained worst posture for sending messages or internet usages. In standing posture, balance is significantly affected by the extensive neck flexion or extension. Apart from adopting poor posture during texting, browsing or watching online video on smart phones, the duration and frequency of had been reported to significantly affect neck joints and structure around these joints (2). In the other study included in this review, where a total of 12 smart phone users used a built-in sensor for neck assessment amongst smart phone user postures. The following positions were proposed for maintaining correct posture while using smart phone continuously to avoid complications in these users. Head must be straight while using mobile during sitting position (10). Through the comparative analysis between degrees of inclination of participants' upper body including neck and average tilt angle of the smartphone in use, it was proposed that an angle ranging from 56.12° to 75.34° may be reasonable for using smart phones. In the latter study it was observed that majority of the participants got awareness when they were guided about the proper posture for using smart phones (for details of other studies please see table 1).

In addition to this study, another study carried out on the influence of cervical flexion angle during the use of smart phones, concluded that trapezius remained the most vulnerable muscle for fatigue when the neck flexion angle was 50 degree while erector spinae muscles remained resilient (11).

## DISCUSSION

The term text neck syndrome is used to describe repeated stress injury and pain in the neck resulting from excessive use of mobile phones. Text neck is a growing lifestyle and health condition with the constant growth in mobile user population all over the world. The aim of this study was to provide an updated review of the literature on the effects of long-term use of smart phones.

Six studies were identified which reported text neck syndrome due to use of prolonged smart phone users. Lee et al. proposed a mobile posture aware system in order to minimize physical health issues in smart phone users. They proposed that smart phone users can be aware about their incorrect postures using built-in sensors (10). Many researchers have suggested various methods and systems to monitor the postures of people. Arteaga, S. et al. reported an accelerometer-based posture monitoring system for stroke survivors (12). Similarly, Farra et al. developed a system to monitor spine health by measuring the inclination of the user's upper back and stress exerted on the spine (13). The results of all these studies reported that posture aware system can reasonably detect incorrect postures and thus helps in maintaining correct postures.

Repetitive and regular usage of the smart phone can lead to cumulative damage and musculoskeletal disorders to the user (10). Ma-

Table 1: Table showing summary of studies included in the review.

#	Author	Country	Year	Mean Age	Diagnostic Info	Measures Used
1	Hosub Lee Sunjae Lee Young Sang Chol	France	2013	20 years	Mobile posture aware system to find the tilt angle of head and neck by smart phone.	Posture analysis equipment named, Back Mapper Smart-phone sensor CATA values
2	Jeon Hyeong Lee KyoChuSeo	Korea	2013	20 years	Severe Addicted Smartphone User showed the largest cervical repositioning errors of flexion, extension, right lateral flexion and left lateral flexion, more likely to show impaired proprioception, musculoskeletal problems.	C-ROM, range of motion meter
3	Man Sig Kim	Korea	2014	Young Adults	The MNP group exhibited greater upper cervical and lower cervical flexion angles than the control group.	Ultrasound based motion analysis system
4	Sangyong Lee Daehee Lee Jungseo Park	Korea	2015	20 years	Muscle fatigue of the RtUT and LtUT were highest when the cervical flexion angle was 50° and lowest when it was 30°.	CROM, Galaxy Note 3, Electromyography, Median Frequency
5	Sojeong Lee Gwanseob Shin	Korea	2015	20 years	Positive relationship between the duration of smartphone use and the severity of head flexion.	Wearable orientation sensor, tracking app
6	Hae Jung Lee	Korea	2016	23 years	Functioning in daily activities should be investigated as prevention for further developing neck pain in smartphone users.	CROM, CVA, Stabilizer, SFMPQ

majority of text neck syndrome reported persistent pain and disability even after discontinuation of mobile use (14). The main reason behind developing text neck syndrome is the inclined posture during mobile use (11). Non-neutral neck posture for prolonged time cause neck stiffness which in long term can lead to biomechanical changes in the cervical area(8). In fact, the major risks for developing musculoskeletal injuries with the use of smart phones could be the static postures that are necessary to hold the mobile phone and the repetitive movements that are required in texting with the fingers(9). Previous studies reported that majority of smart phone users adopt flexed neck posture during texting(15). Lee et al. reported that muscle fatigue levels are highest when cervical flexion angle is 50° or more. Contrary to this, neck muscles are in relaxed position when cervical flexion angle is 30° (11). These reports reveal that text neck syndrome can be minimized if smart phone users are educated about neutral cervical flexion angles.

Despite the fact that current review has some limitations due to limited literature available regarding text neck syndrome in

smart phone users, yet it is one of the first study which described published research articles regarding text neck syndrome in smart phone users. The young generation with the addictive natures to smart phones has deformed their postures leading to text neck syndrome. Not only in standing and sitting, mobiles are used in lying as well which makes head tilt angle more than normal and suffer pain in associated structures. Further studies need be conducted on this overwhelming problem of today. Specific ergonomic guidelines concerning the use of modern electronic devices should be developed to reduce the risk of developing musculoskeletal disorders.

## CONCLUSION

Chronic use of smartphone leads to forward head posture, affecting upper cervical muscles and surrounding skeletal structures including ligaments which can lead to spinal deformities.

## REFERENCES

- Lee S, Shin G, editors. Relationship between smartphone use and the severity of head flexion of college students. Proceedings of the Human Factors and Ergonomics Society Annual Meeting; 2015: SAGE Publications Sage CA: Los Angeles, CA.
- Lee S, Kang H, Shin G. Head flexion angle while using a smartphone. *Ergonomics*. 2015;58(2):220-6.
- Anshari M, Alas Y. Smartphones habits, necessities, and big data challenges. *The Journal of High Technology Management Research*. 2015;26(2):177-85.
- Lin T-M, Chen S-C, Kuo P-J, editors. Motivations for game-playing on mobile devices-using smartphone as an example. International Conference on Technologies for E-Learning and Digital Entertainment; 2011: Springer.
- Adam I. What Would McLuhan Say about the Smartphone? Applying McLuhan's Tetrad to the Smartphone. *Glocality*. 2016;2(1).
- Lapointe L, Boudreau-Pinsonneault C, Vaghefi I, editors. Is smartphone usage truly smart? A qualitative investigation of IT addictive behaviors. 2013 46th Hawaii International Conference on System Sciences; 2013: IEEE.
- Cuellar JM, Lanman TH. "Text neck": an epidemic of the modern era of cell phones? *The Spine Journal*. 2017;17(6):901-2.
- Lee J, Seo K. The comparison of cervical repositioning errors according to smartphone addiction grades. *Journal of physical therapy science*. 2014;26(4):595-8.
- Ko P-H, Hwang Y-H, Liang H-W. Influence of smartphone use styles on typing performance and biomechanical exposure. *Ergonomics*. 2016;59(6):821-8.
- Lee H, Choi YS, Lee S, Shim E, editors. Smart pose: mobile posture-aware system for lowering physical health risk of smartphone users. CHI'13 Extended Abstracts on Human Factors in Computing Systems; 2013: ACM.
- Lee S, Lee D, Park J. Effect of the cervical flexion angle during smart phone use on muscle fatigue of the cervical erector spinae and upper trapezius. *Journal of physical therapy science*. 2015;27(6):1847-9.
- Arteaga S, Chevalier J, Coile A, Hill AW, Sali S, Sudhakhrisnan S, et al., editors. Low-cost accelerometry-based posture monitoring system for stroke survivors. Proceedings of the 10th international ACM SIGACCESS conference on Computers and accessibility; 2008: ACM.
- Farra N, El-Sayed B, Moacdieh N, Hajj H, Hajj Z, Haidar R. A mobile sensing and imaging system for real-time monitoring of spine health. *Journal of Medical Imaging and Health Informatics*. 2011;1(3):238-45.
- Lee H-j. Neck Pain and Functioning in Daily Activities Associated with Smartphone Usage. *The Journal of Korean Physical Therapy*. 2016;28(3):183-8.
- Xie Y, Szeto GP, Dai J, Madeleine P. A comparison of muscle activity in using touch-screen smartphone among young people with and without chronic neck- shoulder pain. *Ergonomics*. 2016;59(1):61-72.