



CASE REPORT

Association Of Portable Electronic Devices With Neck Disability And Carpal Tunnel Syndrome Among Students

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Abstract

Background: Portable electronic devices are essential tools for work, where the globalization has put an impact of dependability on PED's. These devices have benefits on ease of work but have physiological impacts depending on the usage of hours and posture of neck and wrist.

Objectives: PED's have a great impact on the posture, so the objective was finding the correlation between carpal tunnel syndrome with neck disability in relation with usage of PED's in whole day.

Search Methods: Online platform was used with Google forms and circulated.

Selection criteria: The criteria for the study were inclusion of 18 to 25 years of age people with no disability or disorder already present and understandability of English.

Data collection and analysis: The data was collected for 200 people including both male and female where the mean and standard deviation was evaluated for correlation of different aspects of both questionnaires with usage of PED's.

Main Results: On evaluation the mean usage of PED's per day is 5.8 ± 2.4 hours day. The correlation among the NDI-SSS, NDI-FSS, PED's-NDI, PED's-SSS, and PED's -FSS came to be 0.59, 0.51, 0.06, 0.08 and 0.12 respectively.

Authors' conclusions: The relation between carpal tunnel syndrome and neck disability index came to be significant positive in NDI and BCT questionnaire and insignificant positive in correlation in usage of the PED's with CTS and neck disability.

Keyword:- Portable electronic devices, Carpal tunnel syndrome, Neck disability

Abbreviations: PED's: Portable electronic devices, CTS- Carpal tunnel syndrome, NDI- neck disability index, BCT- Boston carpal tunnel, FSS- functional severity scale, SSS- Symptom severity scale.

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1 | INTRODUCTION

The digital revolution has greatly affected daily living, evident in the ubiquity of mobile devices and the seamless integration of technology into common tasks such as shopping, reading, and finding directions (1, 2). The use of computers, mobile devices, and the Internet is at its highest level to date and expected to continue to increase as technology becomes more accessible, particularly for users in developing countries (3) (4). As seen in recent reports the usage of laptops, tablets, and smartphones have gradually been seen as working tools in different professional sectors (5). The usage of computers has been associated with neck pain and wrist pain, though there has been less research on investigating the use of tablet computers that are being used with increasing frequency (6).

Neck pain is a leading global health problem, as it is the 4th greatest contributor to global disability and results in reduced work productivity (7). Poor posture during computer use is a likely contributor to altered muscle activation patterns contributing to neck and shoulder pain (8). Nowadays the usage of PED's is not restricted to work but in leisure activity and continuous exposure to the devices in altered posture for hours changes the properties of muscles, nerves and posture related bone degeneration seen at physiological and anatomical level (9, 10). In various studies the NDI is the most validated and appreciated tool for measuring the disability with the easy questions from subject, focussing on activity of daily living (11).

There are various kinds of altered posture-oriented wrist pain leading to deformity and early degeneration of the carpals, metacarpals and phalanges (12). CTS is commonest causing problem of wrist discomfort, where the median nerve is compressed due to the altered wrist biomechanics leading to compression of median nerve in between the carpal bones causing the pain, tingling or numbness present on palm aspect, travelling to half lateral side of ring finger, complete middle and index finger with thumb on palmar and dorsal aspect (13). BCT questionnaire was came so as to evaluate on the numbers with their discomfort present at the wrist due to carpal tunnel syndrome. This questionnaire is divided into SSS and

FSS focussing on systemic and functional severity faced by the subject (14).

2 | OBJECTIVE OF THE STUDY

In upcoming dependency on the electronic devices and increase in the concept of online education have provided the base to study their effects on human body physiologically and anatomically. The objective of this study finds the correlation between the neck disability index and the Boston carpal tunnel questionnaire on the usage of the PED's.

3 | METHODOLOGY

Source of collection of Data: Online platform using Google forms

Sample size: 200

Study design: Survey study (Questionnaire form)

Selection Criteria:

1. Inclusion Criteria

- Those students who use their own portable electronic devices (smart mobile phones, laptops, and tablets).
- Young adults (18-25yrs)
- Both males and females
- Understands English

2. Exclusion criteria:

- Students having any chronic medical illness.

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- Subjects of age group below 18 years and above 25 years of age.
- Having any kind of injury.
- Cannot understand English.
- Persons having any kind of deformity.

3. *Instrumentation:* - The data was obtained by using an assessment form including: -

- Neck disability index questionnaire
- Boston Carpal tunnel questionnaire (Symptom severity scale- SSS and Functional status scale – FSS)

4 | PROCEDURE

The procedure was done with the survey through online platforms through Google forms were created and consent was prior taken from participant prior sharing their details. They were explained with complete procedure and data collection was begun. There were 208 student who filled the questionnaire out of which 200 were selected according to inclusion criteria. The complete data was observed and statistical data was created with the help of Microsoft Excel and SPSS software.

5 | OBSERVATION AND DATA ANALYSIS

The data analysis was conducted using SPSS software, Pearson's correlation formula was used to find out the correlation.

6 | RESULTS

Upon analysing the duration of portable electronic devices usage (smartphones laptops and tablets) the students use these devices for an average of 5.8 ± 2.4 hours per day and for about 4.8 ± 1.38 days per week.

7 | CORRELATION RESULTS

Upon analysis of correlations, it was found that

1. There is a positive correlation between neck disability and symptom severity scale that is ($r = 0.59$).
2. There is a positive correlation between neck disability and functional status scale that is ($r = 0.51$)
3. There is a partially Positive Correlation b/w the number of hours of portable electronic device use and neck disability that is ($r = 0.06$).
4. There is a partially positive correlation b/w the number of hours of portable electronic device use and symptom severity scale that is ($r = 0.08$).
5. There is a positive correlation b/w the number of hours of portable electronic device use and functional status scale that is ($r = 0.12$)

8 | GRAPHICAL PRESENTATION OF CORRELATION RESULT

9 | DISCUSSION

With increase in the globalization have encouraged the dependability on PED's, but pandemic have initiated the education on the PED's. This study aims on the population spending time on their PED's and in comparison, to the initiation of neck disability and carpal tunnel syndrome.

This study found an average age of 21 years with 6 hours a day of PED's. Studies earlier presented in the college students following the effect of electronic devices on initiation of skeletal disorder where there was positive relation (15), the PEDs have a positive impact on the hand disability as measured (16). Work surroundings have an impact on the musculoskeletal disorder (17), where adults not only the one who are under the posture disability even the adolescents and school children are also behind and upcoming in the musculoskeletal disorders due to the PED's (18, 19). With this increase in dependency

TABLE 1: Shows the mean (average) and standard deviation of 8 components used in the study such as age, height, weight, NDIS, FSS, SSS, PEDU (in hours), PEDU (in days).

STATS. PARAMETERS	MEAN AND St. DEVIATION
AGE	21.52 ± 2.04
HEIGHT	167.7 ± 13.80
WEIGHT	64.06 ± 12.4
PED USAGE / DAY (in hours)	5.8 ± 2.4
PED USAGE / WEEK (in days)	4.8 ± 1.38
NDI	9.68 ± 7.81
	14.85 ± 5.94
FSS	11.25 ± 5.38

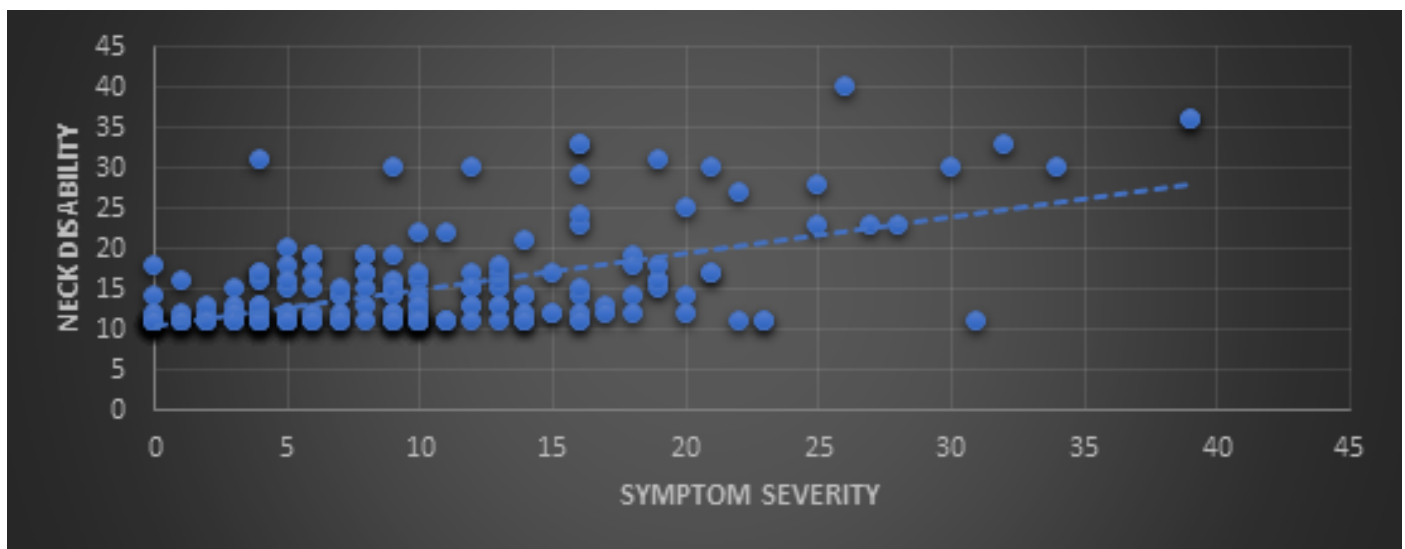


FIGURE 1: Showing a positive correlation between neck disability and symptom severity (CTS). The value of $r = 0.59$ which is not so less in magnitude and has a positive direction which depicts a positive correlation.

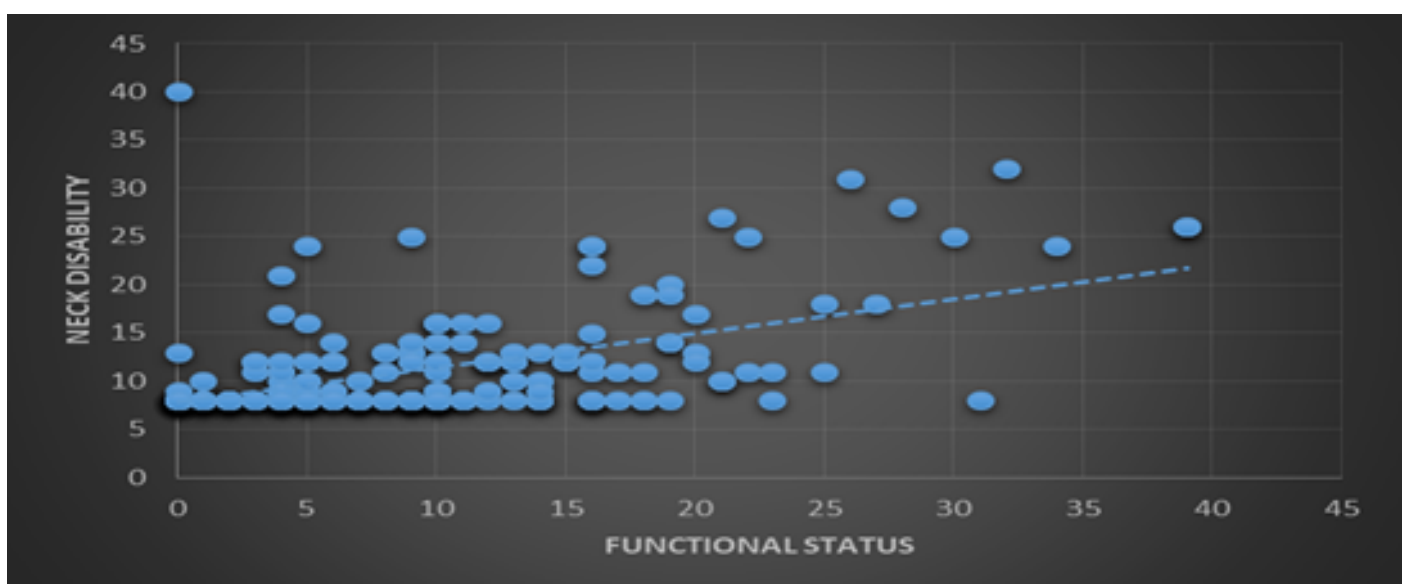


FIGURE 2: Showing a positive correlation between neck disability and functional status (CTS). The value of $r = 0.51$ which is not very less in magnitude and has a positive direction which depicts a positive correlation.

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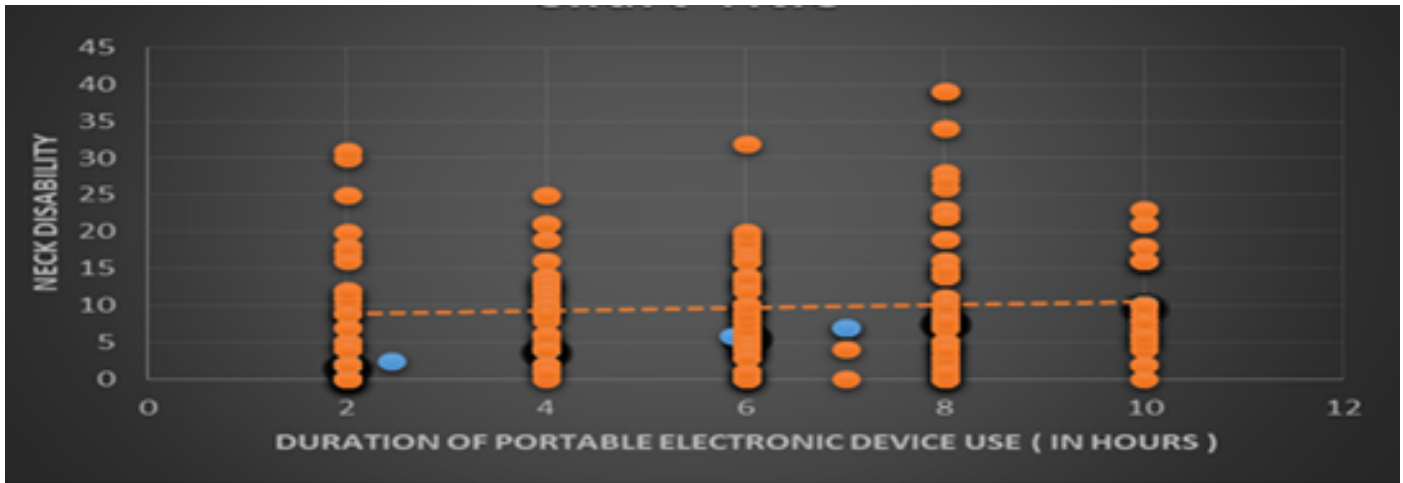


FIGURE 3: Showing a partially positive correlation between the duration of portable electronic devices use (in hours) and neck disability on the student population. The value of $r = 0.065$ is very less magnitude but in a positive direction, this depicts that there is a partially positive correlation of less magnitude.

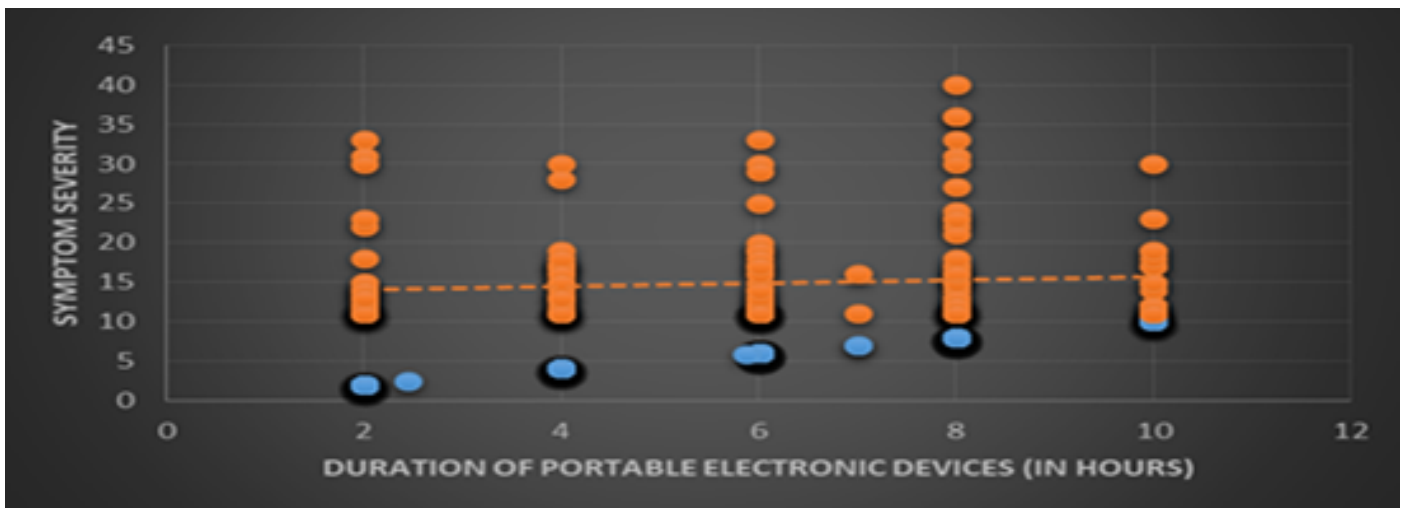


FIGURE 4: Showing a partially positive correlation between the duration of portable electronic devices use (in hours) and symptom severity (CTS) on the student population. The value of $r = 0.08$ is of really less magnitude but in a positive direction, this depicts that there is a partially positive correlation of less magnitude.

the study provided the neck stretching during the working hours and their impact on the disability index which found to be positive and required so as to prevent the initiation and manage the existing disorder (20). So, as this study aimed to evaluate the disability in neck comparing with the time in hours spend in a day.

Studies presented various surveys and assessment to assess the relation of computer usage and carpal tunnel syndrome, where the studies proved the significance of CTS in relation with PED's (21). This study aimed to evaluate on CTS with the help of

Boston carpal tunnel questionnaire which provides the data of their systemic severity and function severity comparing with there hours spent on PED's. This study provided the positive relation between neck disability and CTS.

10 | CONCLUSIONS

This study shows that there is an insignificant positive correlation between the number of hours of portable electronic device usage and neck disability,

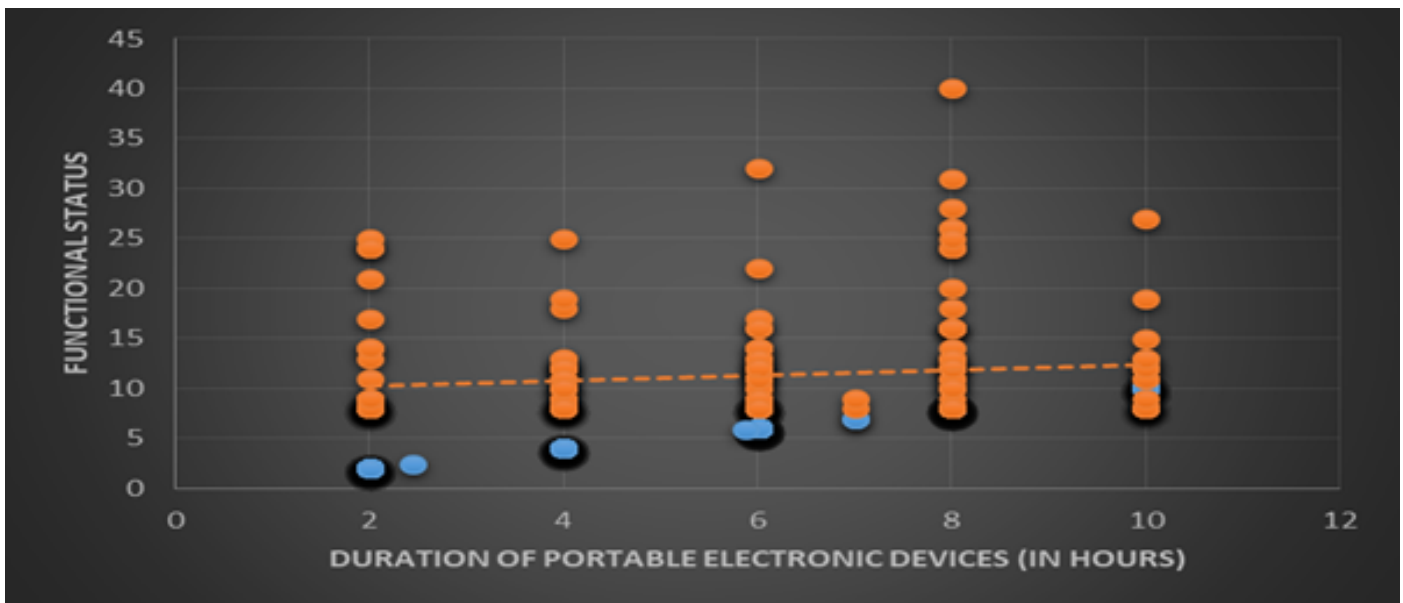


FIGURE 5: Showing a partially positive correlation between the duration of portable electronic devices use (in hours) and functional status (CTS) on the student population. The value of $r = 0.12$ is of really less magnitude but in a positive direction, this depicts that there is a partially positive correlation of less magnitude

carpal tunnel syndrome at $P=0.05$, but there is a significant positive correlation between neck disability and carpal tunnel syndrome at $p=0.05$

The results of the study do not nullify the hypothesis that is the alternate hypothesis is accepted as it showing positive correlation.

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REFERENCES

1. Schindler LA, Burkholder GJ, Morad OA,

Marsh C. Computer-based technology and student engagement: a critical review of the literature. *International journal of educational technology in higher education*. 2017 Dec;14(1):1-28.;

2. Anderson M. More Americans using smartphones for getting directions, streaming TV. *Pew Research Center*. 2016 Jan 29;29.;

3. McHenry MS, Fischer LJ, Chun Y, Vreeman RC. A systematic review of portable electronic technology for health education in resource-limited settings. *Global health promotion*. 2019 Jun;26(2):70-81.;

4. Damrongpanit S, Samuttai R, Srisuk K, Nguenyuang S, Intanate N. The development of indicators for utilising portable electronic devices of the undergraduates. *The Social Sciences*. 2016;11(21):5080-9.;

5. Beno M. Mobile Teleworking—Its Effects on Work/Life Balance, a Case Study from Austria. In *Computer Science On-line Conference 2020* Jul 15 (pp. 161-171). Springer, Cham.;

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6. Anand B, Thakur S, Sharma P. Association between Discomfort and Fatigue around Neck Area due to Portable Electronic Devices in College Students. *Journal of Exercise Science & Physiotherapy* Vol. 2020;16(2).;
7. Biadgo GH, Tsegay GS, Mohammednur SA, Gebremeskel BF. Burden of Neck Pain and Associated Factors Among Sewing Machine Operators of Garment Factories in Mekelle City, Northern Part of Ethiopia, 2018, A Cross-Sectional Study. *Safety and Health at Work*. 2021 Mar 1;12(1):51-6.;
8. Adachi G, Oshikawa T, Akuzawa H, Kaneoka K. Differences in the activity of the shoulder girdle and lower back muscles owing to postural alteration while using a smartphone. *The Journal of Medical Investigation*. 2020;67(3.4):274-9.;
9. Alghadir AH, Iqbal ZA. Effect of Deep Cervical Flexor Muscle Training Using Pressure Biofeedback on Pain and Forward Head Posture in School Teachers with Neck Pain: An Observational Study. *BioMed Research International*. 2021 May 22;2021.;
10. Short N, Cool A, DeLay A, Lannom A, O'Donnell L, Stuber R. Effect of Mobile Tech Posture on the Subacromial Space: A Pilot Sonographic Analysis. *Annals of International Occupational Therapy*. 2020 Oct 28.;
11. Young BA, Walker MJ, Strunce JB, Boyles RE, Whitman JM, Childs JD. Responsiveness of the Neck Disability Index in patients with mechanical neck disorders. *The Spine Journal*. 2009 Oct 1;9(10):802-8.;
12. Gondol BN, Areba AS, Kanno GG, Mamo TT. Prevalence of Visual and Posture Related Symptoms of Computer Vision Syndrome among Computer User Workers of Ethiopian Roads Authority. *Journal of Environmental and Occupational Health*. 2020 Oct 22;10(3):79-90.;
13. Genova A, Dix O, Saefan A, Thakur M, Hassan A. Carpal tunnel syndrome: a review of literature. *Cureus*. 2020 Mar;12(3).;
14. Bougea A, Zambelis T, Voskou P, Katsika PZ, Tzavara C, Kokotis P, Karandreas N. Reliability and validation of the Greek version of the Boston Carpal Tunnel Questionnaire. *Hand*. 2018 Sep;13(5):593-9.;
15. Lepp A, Barkley JE, Karpinski AC. The relationship between cell phone use and academic performance in a sample of US college students. *Sage Open*. 2015 Feb 18;5(1):2158244015573169.;
16. Anand B. Association of hand performance and neck disability. *Indian Journal of Physiotherapy and Occupational Therapy*. 2020 Oct;14(4):13.;
17. Soria-Oliver M, López JS, Torrano F, García-González G, Lara Á. New patterns of information and communication technologies usage at work and their relationships with visual discomfort and musculoskeletal diseases: Results of a cross-sectional study of spanish organizations. *International journal of environmental research and public health*. 2019 Jan;16(17):3166.;
18. Al-Hadidi F, Bsisu I, AlRyalat SA, et al. Association between mobile phone use and neck pain in university students: A cross-sectional study using numeric rating scale for evaluation of neck pain. *PLoS One*. 2019;14(5):e0217231.;
19. Kim HJ; DH, Kim JS. The relationship between smartphone use and subjective musculoskeletal symptoms and university students. *J Phys Ther Sci*. 2015;27(3):575-579. ;.
20. Anand B, Goyal V. Effectiveness of Neck and Shoulder Stretching Program among Professionals Working from Home During Covid-19. *Call for Editorial Board Members*.:61.;
21. Bhanderi DJ, Mishra DG, Parikh SM, Sharma DB. Computer use and carpal tunnel syndrome: A case-control study. *Indian journal of occupational and environmental medicine*. 2017 Sep;21(3):109.;

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