

Association of Musculoskeletal Pain and Psychological Stress with the use of Personal Electronic Devices among College Going Students – A Virtual Cross-sectional Study

Vinit Mody¹, Amirhamza Chauhan², Jash Desai³

¹Associate Professor, Department of Physiotherapy, (MPT Musculoskeletal Conditions), ²Student (MPT Musculoskeletal and Sports), ³Student (MPT in Sports Physiotherapy), Pioneer Physiotherapy College, Sayajipura, Vadodara, Gujarat, India

Abstract

Background: Computer use is associated with increased risk for musculoskeletal disorders due to adopted static postures and highly repetitive hand motions. At colleges, students use computers, mobile phones, laptop or tablet for communication, learning and entertainment. Social isolation, loneliness, physical inactivity or sedentary lifestyle are individual entities. Owing to the present situation, where the public interaction is restricted, the above factors can interfere in mental health status as well as on musculoskeletal system of the students. So, the aim was to study the association of musculoskeletal pain and psychological stress with the use of personal electronic devices among college going students.

Method: An online short form questionnaire was prepared using Google forms which consisted of survey related questions from Nordic Musculoskeletal Questionnaire and Perceived Stress Scale. Total 100 college going students were recruited as per selection criteria and online form was distributed amongst them. Data analysis by chi-square test showed significant association of musculoskeletal pain ($P < 0.05$) but no association of psychological stress ($P > 0.05$) with the use of personal electronic devices among college going students.

Conclusion: Musculoskeletal pain was commonly associated with the use of personal electronic devices rather than psychological stress among college going students.

Keywords: Nordic Musculoskeletal Questionnaire, Perceived Stress Scale

Introduction

Computer use for prolonged time would contribute to increased risk for musculoskeletal

Corresponding Author :

Dr. Vinit Mody (PT),

Associate Professor, MPT Musculoskeletal Conditions, Pioneer Physiotherapy College, Sayajipura, Vadodara, Gujarat, India
vinny410@gmail.com

disorders (MSD).^{1,2} These disorders include neck pain, shoulder strain, forearm tenosynovitis, carpal tunnel syndrome and deQuervain's syndrome.³ For mobile phone use, excessive neck flexion posture and thumb joint strain have been reported to be significant factor for musculoskeletal disorders and these studies were based on conventional keypad phones.^{4,5} So far, only few of exploratory studies have examined the physical demands in using multi-touch devices⁶⁻⁹, reporting on the neck and upper limb posture as

well as muscle activity in using smart phone devices. These are mainly based on standardized tasks of short durations from 1 to 10 minutes in either sitting or standing positions. A recent systemic review has reported that there is some evidence for the factors of neck flexion, frequency of phone calls, texting and gaming contributing to musculoskeletal complaints among mobile phone users.¹⁰

Healthcare practitioners like nurses, dentists and physical therapists have been identified at risk for development of Work Related Musculoskeletal Disorders (WRMD) due to risk factors like heavy physical work, repeated lifting & handling of loads, overstrained and awkward posture in the form of bending & twisting, repetitiveness of different joint movements, use of high frequency vibration tools, psychological stress and prolonged stationary body position.¹¹⁻¹⁶

Musculoskeletal disorders include a wide range of inflammatory and degenerative conditions affecting muscles, tendons, ligaments, joints, peripheral nerves and blood vessels.¹⁷ These disorders are associated with high social and economic costs,¹⁸ ultimately affecting the quality of life.^{17,19}

Nordic Musculoskeletal Questionnaire (NMQ): The NMQ can be used as a questionnaire or as a structured interview. However, significantly higher frequencies of musculoskeletal issues were reported when the questionnaire was administered as a part of a focused study on musculoskeletal issues and work factors than when administered as a part of a periodic general healthy examination.²⁰

Section 1: a general questionnaire of 40 items identifying areas of body causing musculoskeletal problems. Completion is reinforced by a body map to indicate nine symptom sites being neck, shoulders, upper back, elbows, low back, wrist/hands, hips/

thighs, knees and ankles/feet. Participants are asked if they had any musculoskeletal issue in the last 12 months and last 7 days which has restricted their normal activity.

Section 2: additional questions relating to a neck, the shoulders and the lower back relevant issues. 25 questions elicit any accidents affecting each area, functional effect at home and work (change of job or duties), duration of the problem assessment by a healthcare practitioner and musculoskeletal problems in the last 7 days.

Perceived Stress Scale (PSS): PSS is the most widely utilized psychological instrument for measurement of perception of stress. It is a measure of the degree to which situation in one's life are considered as stressful. Items are designed to highlight how unpredictable, uncontrollable and overloaded participants find their lives. The scale also includes a count of direct queries about current levels of experienced stress. The items are easy to comprehend and the response alternatives are simple to grasp. The questions in the PSS ask about emotions and thoughts during the last month. In each case, participants are asked how often they felt a certain way.^{21,22}

Materials and Method

Study Design: A Virtual Cross-Sectional study

Study Population: College going students

Study Setting: Physiotherapy Colleges in Vadodara

Sampling Design: Convenience sampling method

Sample size: 100 students

Inclusion criteria:

- Age group: 18 to 24 years
- Gender: Both male and female

- Students showing signs of musculoskeletal pain as well as psychological stress.
- Students who are able to comprehend commands.
- Willingness to participate in the study.

Exclusion criteria:

- Students suffering from chronic disease affecting the musculoskeletal system such as rheumatoid arthritis, osteoarthritis and other connective tissue disorders.
- Any previous trauma or surgery or infection anywhere in the body.
- Students who are not physically fit during the time of data collection.
- Students suffering from major psychological ailments like schizophrenia, dementia etc.

Materials used:

- Google Survey Form
- Nordic Musculoskeletal Questionnaire (NMQ)
- Perceived Stress Scale (PSS)

Outcome Measures:

1) Nordic Musculoskeletal Questionnaire (NMQ)

- NMQ was established from a project funded by the Nordic Council of Ministers.
- The NMQ can be utilized as a questionnaire or as a structured interview.
- Advantages:
 - a) Standardization of the questions
 - b) Worldwide recognition

- c) Used free of charge
- d) Possibility of self-evaluation
- e) Relatively quick identification of the symptoms
- f) Applicability in large populations
- Limitations:
 - a) Obligatory answering of the questions
 - b) Difficulty in determining the truthfulness of the responses
 - c) Encounter problem of application in countries that do not speak english (for errors in translation, interpretation and/or validation)
 - d) Restriction of questions to three areas of the body (lower back, neck and shoulders)
 - e) Identification only of the symptoms
 - f) Complex data analysis for large populations
 - g) Different aspects of responses depending on the technician administering the questionnaire

2) Perceived Stress Scale (PSS)

- PSS is the most widely utilized psychological instrument for measurement of perception of stress.
- It is a measure of the degree to which situations in one's life are considered as stressful.
- Items were designed to tap how unpredictable, uncontrollable and overloaded participants find their lives.
- The scale also includes a count of direct queries about current levels of experienced stress.
- The items are easy to comprehend and the response alternatives are simple to grasp.

The questions in the PSS ask about emotions and thoughts during the last month.

Scoring: PSS scores are obtained by responses (e.g. 0 = 4, 1 = 3, 2 = 2, 3 = 1 & 4 = 0) to the four positively stated items (items 4, 5, 7 & 8) and then summing across all scale items.

Individual scores on PSS can range from 0-40 with higher scores indicating higher level of perceived stress:

a) Scores ranging from 0-13 will be considered low stress

b) Scores ranging from 14-26 will be considered moderate stress

c) Scores ranging from 27-40 will be considered high perceived stress

A short form questionnaire was prepared using online portal named Google forms which consisted of survey related questions from Nordic Musculoskeletal

Questionnaire (NMQ) and Perceived Stress Scale (PSS). The following link was created using the Google form : <https://forms.gle/Cr4HfrZk3b4hEeUG6>. Total 100 college going students (age between 18-24) were selected (convenience sampling) on the basis of inclusion and exclusion criteria from Physiotherapy Colleges in Vadodara. After taking virtual informed consent from the students, study was executed. The online link for Google form was distributed amongst the students selected for this study and the responses were recorded in the Microsoft excel sheet for further data analysis.

Results and Discussion

Ø Data was analysed by SPSS software version 20.0 and Microsoft Excel 2010. Prior to the statistical test, data was screened for normal distribution by Shapiro-Wilk test. After normal distribution of the data, Chi-square test (non-parametric test) was applied at 0.05 level of significance with 95% of confidence interval.

Table 1. Correlation of musculoskeletal pain with the use of personal electronic devices

Use of Electronic Devices	No. of Regions (Musculoskeletal Pain)			Chi-square value	Degrees of freedom (df)	P value
	(1)	(2)	(3)			
Laptops	2 1.43 0.227203	2 1.64 0.079024	0 0.92 0.92	59.35	14	0.005
Laptops, Tablets	1 0.35 1.207143	0 0.41 0.41	0 0.23 0.23			
Smartphones	44 30.15 6.362272	28 34.6 1.211016	12 19.38 2.810341			
Smartphones, Laptops	5 9.33 2.009528	18 10.66 5.053996	3 6 1.5			
Smartphones, Laptops, Tablets	0 1.43 1.43	4 1.64 3.396098	0 0.92 0.92			
Smartphones, Laptops, Tablets, Television	0 1.07 1.07	0 1.23 1.23	3 0.69 7.733478			
Smartphones, Laptops, Television	1 6.82 4.966628	6 7.79 0.411309	12 4.38 13.25671			
Smartphones, Television	3 5.38 1.052862	6 6.15 0.003659	6 3.46 1.864624			

Table 2. Correlation of psychological stress with the use of personal electronic devices

Use of Electronic Devices	Perceived Stress Scale Interpretation			Chi-square value	Degrees of freedom (df)	P value
	Low	Moderate	High			
Laptops	0 0.24 0.24	1 0.6 0.266667	2 2.16 0.011852	7.05	14	0.99
Laptops, Tablets	0 0.08 0.08	0 0.2 0.2	1 0.72 0.108889			
Smartphones	5 4.96 0.000323	14 12.4 0.206452	43 44.64 0.060251			
Smartphones, Laptops	2 1.2 0.533333	4 3 0.333333	9 10.8 0.3			
Smartphones, Laptops, Tablets	0 0.16 0.16	0 0.4 0.4	2 1.44 0.217778			
Smartphones, Laptops, Tablets, Television	0 0.08 0.08	0 0.2 0.2	1 0.72 0.108889			
Smartphones, Laptops, Television	1 0.64 0.2025	1 1.6 0.225	6 5.76 0.01			
Smartphones, Television	0 0.64 0.64	0 1.6 1.6	8 5.76 0.871111			

Here, Chi-square (non-parametric) test showed significant association of musculoskeletal pain ($\chi^2= 59.35$, $df=14$, $P< 0.05$) but no association of psychological stress ($\chi^2= 7.05$, $df=14$, $P> 0.05$) with the use of personal electronic devices among college going students.

In this study, a short form questionnaire was prepared using online portal named Google form which consisted of survey related questions from

Nordic Musculoskeletal Questionnaire (NMQ) and Perceived Stress Scale (PSS).

The results of this study (using non-parametric tests) showed that there was significant association of musculoskeletal pain with the use of personal electronic devices as measured by Nordic Musculoskeletal Questionnaire (NMQ) but there was no association of psychological stress with the use of personal electronic devices as measured by Perceived

Stress Scale (PSS).

Conclusion

The results of this study supported the alternative hypothesis (H_A) and indicated that there was significant association of musculoskeletal pain with the use of personal electronic devices as measured by Nordic Musculoskeletal Questionnaire (NMQ). The findings also supported the null hypothesis (H_0) and showed that there was no association of psychological stress with the use of personal electronic devices as measured by Perceived Stress Scale (PSS). So, this study concluded that musculoskeletal pain was commonly associated with the use of personal electronic devices rather than psychological stress among college going students.

Limitations

· Due to pandemic situation, this study was conducted virtually rather than physically by preparing a short form questionnaire using online portal named Google forms.

· The present study only examined a total of 100 college going students using a convenience sampling method and this sample size is not sufficient for identifying a significant relationship between musculoskeletal pain and use of personal electronic device.

Ethical Clearance – Ethical clearance was obtained from The Institutional Review Board from Pioneer Physiotherapy College, Vadodara.

Source of Funding – Self

Conflict of interest – Nil

References

- 1) Blatter B.M., Bongers P.M. Duration of computer use and mouse use in relation to musculoskeletal disorders of neck or upper limb. *Int. J. Ind. Ergon.* 2002;30:295–306.
- 2) Gerr F., Marcus M., Monteilh C. Epidemiology of musculoskeletal disorders among computer users: lesson learned from the role of posture and keyboard use. *J. Electromyogr. Kinesiology* 2004;12:25–31.
- 3) Waersted M., Hanvold T.N., Veiersted K.B. Computer work and musculoskeletal disorders of the neck and upper extremity: A systematic review. *BMC Musculoskeletal Disorders* 2010;11:79–94.
- 4) Gold J.E., Driban J.B., Thomas N., Chakravarty T., Channell V., Komaroff E. Postures, typing strategies, and gender differences in mobile device usage: An observational study. *Appl. Ergon.* 2012;43:408–412.
- 5) Gustafsson E., Johnson P.W., Hagberg M. Thumb postures and physical loads during mobile phone use—A comparison of young adults with and without musculoskeletal symptoms. *J. Electromyogr. Kinesiology* 2010;20:127–135.
- 6) Kietrys D.M., Gerg M.J., Dropkin J., Gold J.E. Mobile input device type, texting style and screen size influence upper extremity and trapezius muscle activity and cervical posture while texting. *Appl. Ergon.* 2015;50:98–104.
- 7) Kim Y., Kang M., Kim J., Jang J., Oh J. Influence of the duration of smartphone usage on flexion angles of the cervical and lumbar spine and on reposition error in the cervical spine. *Phys. Ther. Korea.* 2013;20:10–17.
- 8) Kim M.S. Influence of neck pain on cervical movement in the sagittal plane during smartphone use. *J. Phys. Ther. Sci.* 2015;27:15–17.
- 9) Xie Y., Szeto G.P., Dai J., Madeleine P. A comparison of muscle activity in using touchscreen smartphone among young people

- with and without chronic neck–shoulder pain. *Ergonomics*. 2016;59:61–72.
- 10) Xie Y., Szeto G.P.Y., Dai J. Prevalence and risk factors associated with musculoskeletal complaints among users of mobile handheld devices: A systematic review. *Appl. Ergon*. 2017;59:132–142.
 - 11) Szymanska J. Disorders of the musculoskeletal system among dentists from the aspect of ergonomics and prophylaxis. *Ann Agric Environ Med*. 2002;9(2):169–73.
 - 12) Akesson I, Lundborg G, Horstmann V, Skerfving S. Neuropathy in female dental personnel exposed to high frequency vibrations. *J Occup Environ Med*. 1995;52(2): 116–23.
 - 13) West DJ, Gardner D. Occupational injuries of physiotherapists in North and Central Queensland Aust *J Physiother*.2001;47(3):179-86.
 - 14) Coenen P, Kingma I, Boot CR, Twisk JW, Bongers PM, van Dieen JH. Cumulative low back load at work as a risk factor of low back pain: A prospective cohort study.*J Occup Rehabil*. 2013;23(1):11–18.
 - 15) Dawson AP, Steele EJ, Hodges PW, Stewart S. Development and test–retest reliability of an extended version of the Nordic Musculoskeletal Questionnaire (NMQ-E): a screening instrument for musculoskeletal pain. *The Journal of Pain*. 2009 May 1;10(5):517-26.
 - 16) Pugh JD, Gelder L, Williams AM, Twigg DE, Wilkinson AM, Blazeovich AJ. Validity and reliability of an online extended version of the Nordic Musculoskeletal Questionnaire (NMQ-E2) to measure nurses’ fitness : *J Clin. Nurs*. 2015;24(23-24):3550-63.
 - 17) Punnett L, Wegman DH. Work-related musculoskeletal disorders: the epidemiologic evidence and the debate. *J Electromyogr Kinesiol*. 2004;14(1):13-23.
 - 18) Dembe AE. The social consequences of occupational injuries and illnesses. *Am J Ind Med*.2001;40(4):403-417.
 - 19) Liao JC, Ho CH, Chiu HY, et al. Physiotherapists working in clinics have increased risk for new-onset spine disorders: a 12-year population-based study. *Medicine (Baltimore)*. 2016; 95(32):e4405.
 - 20) Andersson K, Karlehagen S, Jonsson B. The importance of variations in questionnaire administration. *Appl Ergon* 1987;18:229–232.
 - 21) The PSS Scale is reprinted with permission of the American Sociological Association, from Cohen, S., Kamarck, T., and Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Social Behavior*, 24, 386-396.
 - 22) Cohen, S. and Williamson, G. Perceived Stress in a Probability Sample of the United States. Spacapan, S. and Oskamp, S. (Eds.) *The Social Psychology of Health*. Newbury Park, CA: Sage, 1988.