Health Related Problems and Computer use Among Students

Lalita Kumari
Senior Research Fellow
Guru Nanak Dev University,
Distt-Amritsar, Punjab

Abstract

This study is an attempt to estimate prevalence of computer related health problems/musculoskeletal discomforts among college students and to investigate association of health problems/musculoskeletal discomforts with duration of computing. 300 college students were studied from Punjab state of India using computer and laptops. Majority of respondents were female, graduate and fall in 20-25 years age group, use desktop and work on computer 2-4 hours and take at least once an hour break during working on computer. Chi Square test and 'T' test was used to test the hypothesis. There is association between musculoskeletal problems due to Computer Usage and years of working on computer and between musculoskeletal problems due to Computer Usage and hours of working on computer. Health related problems/Musculoskeletal discomforts are independent of Gender except lower back pain which is more in females. There is no difference in Health related problems/Musculoskeletal discomforts between desktop users and Laptop users.

Keywords: Health, Computer, Musculoskeletal discomforts

Introduction

Computer use among college students has increased dramatically in the last few years. Most academic programs now require a computer and computer literacy for enrollment. In every field, one cannot think without computer work. It has decreased work load in offices, college, school and business sector. Computer has become a connecting and communicating media these days.

Computer work involves repetitive moment of upper limbs, adapted postures using laptops in bed and using desktop sitting on a chair. There are changes in musculoskeletal structures causing tightness, fatigue, neck ache other joint symptoms.

Studies done by different researchers have found that up to 80% people experience physical discomfort during or after computer work.

Need of the Study

There is insufficient data on musculoskeletal related to computer use among Indian population. Concentrating the differences in academic schedule in college program and duration of computing, there is need to evaluate Health related and musculoskeletal complaints (MSK) related to computer use among student.

Table 1: Empirical Literature on Computer Related Health Problems.

Author (Year)	Country	study design & Sample Size	Instrument Used	Methodology	Results of the study
Karen Jacob (2002)	New England	cross-sectional study and 6th and 7th grade students in three middle schools	survey used in the study to determine the prevalence of computer-related musculoskeletal discomfort/pain was adapted from one used by Katz, Amick, Carroll, Hollis, Fossel, & Coley (2000) in their research on the prevalence of upper extremity musculoskeletal	Percentage and Chi-Square test	Musculoskeletal (MSC) discomfort/pain associated with computer use in adults may be prevalent throughout middle school aged students. 40% of those participants with computer-related MSC discomfort/pain reported taking a break from using the computer once an hour. This finding suggests that they may be aware of the MSC discomfort/pain and take a break to relieve this discomfort. Despite 95.3% of the students reporting spending 0-6 hours/day using a computer, the amount of time spent using the computer was
			disorders in college students.		not associated with musculoskeletal discomfort/pain.
Sotoyama *et al.*(2002)	*USA*	Cross Sectional Study and 100 ele-mentary, junior high, and high schools	questionnaires	Percentage	Concluded that most schools are slow in developing instructive programs about environment and ergonomics in relation to the computer workspace. Although children currently were not experiencing musculoskeletal problems, a concern for future problems with the prospected rise in use of computers in the classroom was expressed. This rise in computer use can lead to physical problems if measures are not taken to improve ergonomic positioning.
Ketola *et al.*(2002)	*USA*	Cross Sectional Study and 124 subjects	questionnaires	Percentage	More use of computer is the major cause of musculoskeletal and ergonomics education

					helped reduce discomfort; however, the best results were achieved by cooperative planning in which both workers and practitioners were involved
Shari McMahan and Rafer Lutz (2003)	*California*	cross-sectional study and *512 college students*	survey	*Percentage, MANOVA and Regression*	The most frequently reported disorders were related to eyestrain affecting nearly 85%, and upper back and neck pain affecting 70% of computer users. This study confirmed the effectiveness of training in workstation design considering that these two recommendations are among the most recommended strategies in the workstation design literature
Eric et al. (2004)	California	cross-sectional study and 206 Electrical Engineering and	304 graduate students randomly selected, 206	Chi-Square statistic and Univariate logistic regression	Approximately 60% of respondents reported upper extremity or neck pain attributed to computer use and
		Computer Science (EECS) graduate students	completed the questionnaire (67% participation rate) with 69% completing the questionnaire online, and 31% by telephone.		reported a mean pain severity score of 4.5 (_2.2; scale 0–10). In a final logistic regression model, female gender, years of computer use, and hours of computer use per week were significantly associated with pain. The high prevalence of upper extremity pain reported by graduate students suggests a public health need to identify interventions that will reduce symptom severity and prevent impairment.
Moras et al. (2007)	*USA*	random-cross sectional study of 361 undergraduate students	survey	Percentage	Assess levels of discomfort, previous laptop use, major and non-musculoskeletal problems such as eye pain and headaches. Neck pain was the most common complaint, followed by upper and lower back.

Shyam Sundar Prasad Shah Dr.M.V.Shetty (2007)	India(Bangalore)	Cross sectional study and 500 college students reporting computer use	questionnaire method and interview	T-test and Chi-square test	Prevalence of computer related musculoskeletal complaints among college students were very common and there was association of musculoskeletal complaints with adverse tissue tension and duration of computing.
Muthunarayanan (2013)	India (Chennai)	cross-sectional study and 416 private university students comprising of final year Medical and Engineering (Computer science and Information technology) students studied	structured questionnaire	Percentage and Multiple Logistic Regression	Out of 416 students studied, 58% of them viewed computer at a distance of 20 to 40 inches, 61 % viewed the computer screen at the same level, 42.8% placed the reference material between monitor and key board, 24.5% tilted screen backward and 75.7% took frequent breaks to prevent CVS. Students who viewed the computer at a distance of less than 20 inches, viewed upwards or downwards
					to see the computer, who did not avoid glare and did not took frequent breaks were at higher risk of developing CVS. Students who did not used adjustable chair, height adjustable keyboard were at higher risk of developing neck and shoulder pain. The students who were not practicing ergonomics principle and did not check posture and make ergonomic alteration were at higher risk of developing CVS.
Venkatesan et al.(2012)	Malaysia	A cross-sectional study was performed among 200 college students aged 19-27 years using random	Questionnaire	Percentage and Correlation analysis	About 88% (149/170) of the respondents reported musculoskeletal complaints in the two weeks prior to completing the survey. The prevalence of musculoskeletal pain was higher in female 90%

		sampling, two surveys			than in male students 76%. Although there was no statistically significant association between the type of computer and musculoskeletal pain, the prevalence of musculoskeletal pain was higher for students using laptop (90%) when compared to those using both desktop and laptop and desktop only (87 and 86%) respectively. There was no statistically significant correlation for musculoskeletal pain with hours of computer use per day, type of computer used and level of physical activity.
Chavda et al. (2013)	*India (Gujarat)*	cross-sectional study and 100 students	Self-reporting Questionnaire	Percentage	Current practice of laptop's usage was ergonomically improper. Prolonged usage in improper posture has created various musculoskeletal problems among medical students
Bansal et al.(2013)	*India (SURAT)*	cross sectional study of 290 selected students of information technology in various college	an interviewer-administered questionnaire	Percentage	prevalence of the symptoms like watering in eyes, eye strain, back pain, shoulder pain, neck pain and many other problems which were common among the students and become more persistent with the increase in hours of work and study also examined gender variations
Peter et al. (2014)	College of Health Professions, Medical University of South Carolina, Charleston, USA	convenience sample and 260 graduate students	questionnaire	paired t-test for equality of means including an independent samples test and analysis using ANOVA	Results showed that subjects demonstrated a statistically significant im-provement in ergonomics knowledge after they completed the ergonomic educational session. Some participants reported making adaptations to laptop positioning and equipment use fol-lowing the educational session. Thus, partici-pating in ergonomic education can positively influence awareness of body mechanics relative to laptop workstation design

Source: Compiled from various studies

Objectives of Study

1. To estimate prevalence of computer related health problems/musculoskeletal discomforts among college students
2. To identify nature and distribution of problems associated with computer usage
3. To investigate association of health problems/musculoskeletal discomforts with duration of computing.

Hypothesis

There is no association between Health related problems/Musculoskeletal discomforts and hours of use of desktop/laptop in a day.

There is no association between Health related problems/Musculoskeletal discomforts and years of desktop/laptop use.

Perception of respondents regarding Health related problems/Musculoskeletal discomforts is independent of Gender.

There is no difference in Health related problems/Musculoskeletal discomforts between desktop users and Laptop users.

Materials and Methodology

Source of Data: 300 College students of Punjab state.

Definition of Study Subjects: College students using computer (laptop and desktop).

Inclusion and Exclusion Criteria

Inclusion Criteria

College student in the age group to >15 to 35 years.

Students of both genders reporting use of computer.

Exclusion Criteria:

Uncooperative students.

Structural deformities of spine or upper limb.

Study Sampling Design, Method and Size:

Sample Design: Sample of convenience

Method Of Collection Data: Survey by questionnaire method.

Sample – Size: 300 college and universities students reporting computer use.

Parameters used for comparison and statistical analysis used: The collected data is analyzed by Percentage, chi – square test and t – test.

Duration of study: one week (March to June, 2015)

Methodology

Survey was done in different colleges conducting computer related courses. Questionnaire was distributed among students to measure computer related health problems/musculoskeletal discomforts. Student reporting computer related healthproblems/musculoskeletal discomforts were asked questions in survey to obtain details in nature, distribution, duration and other contributing factors.

Data Analysis

Sample characteristics

Table 2: Demographic Profile of Respondents

Demographic Variables		No. of Respondents (%)
Gender	Male	138(46)
	Female	162(54)
Age (Yrs)	15-20 Years	72 (24)
	20-25 years	126(42)
	25-30 Years	66(22)
	30 -35 Years	36(12)
Education Level	Under Graduate	84 (28)
	Graduate	114(38)
	Post Graduate	54(18)
	Research Schloar	48(16)

As far as the demographic profile of the respondents is concerned, the sample comprised of variety of respondents belonging to different educational background. The demographic background of the sampled respondents is presented in Table no. 2. Table reveals that majority of respondents were female. The table also shows that the majority of the respondents (42%) belonged to the age group of 20-25 years of age. The next largest category comprised of respondents between 15-20 years of age (27 %). The next category of respondents was of the age group of 25-30 years (22%), while those falling in the age category of 30-35 formed just 12% of the sample. It brings out that 38% of the respondents were graduates followed by under graduates (28%). The next category comprised of respondents who were post graduates (18%).While 16 % of the respondents' perusing doctoral degree.

Table: 3 Type of Computer Used for browsing/typing/downloading

Computer Used for browsing/typing/downloading	Frequency	Percentage
Desktop	180	60
Laptop	120	40
Total	3000	100

Table 3 indicates that 60 per cent of respondents were used desktop and 40 percent were used Laptop for browsing/typing/downloading.

Table 4: Years of Working on Desktop/Laptop

Years of Working on Desktop/Laptop	Frequency	Percentage
<3 Years	72	24
3-6 Years	126	42
6-9 Years	60	20
9-12 Years	18	6
12-15 Years	24	8
>15 Years	0	0
Total	300	100

Table 4 indicates that majority of respondents were working on desktop/Laptop for 3 -6 years, followed by <3 years, followed by 6-9 years, 12-15 years and 9-12 years.

Table 5 Hours of work on Computer/Laptop per day

Hours of work on Computer/Laptop per day	Frequency	Percentage
0-2 Hours	54	18
2-4 Hours	138	46
4-6 Hours	66	22
6-8 Hours	30	10
8+ Hours	12	4
Total	300	100

Table 5 indicates majority (46 per cent) of respondents were work 2-4 hours per day on computer, followed by 4-6 hours, 0-2 hours and 6-8 hours. While just 4 per cent work more than 8 hours.

Table 6 Frequency of taking breaks from working on the computer

Frequency of taking breaks from working on the computer	Frequency	Percent
More than once an hour	24	8
Only after 2 hours work	18	6
Once every 1-2 hours	60	20
At least once an hour	126	42
Never	72	24

Table 6 indicates majority (42 per cent) of respondents took break at least once an hour, followed by never (24 per cent) Once every 1-2 hours (20 per cent) , More than once an hour (8 per cent), Only after 2 hours work (6 per cent).

Table: 7 Position of computer screen

Position of computer screen	Frequency	Percentage
At same level	150	50
Upward	102	34
Downward	48	16

Table 7 indicates majority 50 per cent keep their computer screen at same level. While 16 per cent keep computer screen downward.

Table: 8 Place of reference material while typing

Place of reference material while typing	Frequency	Percentage
Between Monitor/screen and Keyboard	10	20
Above the Monitor/screen	17	34
Sides of the Monitor/screen	23	46

Table 8 indicates the place of reference material while typing on computer. Majority (46 per cent) respond they kept it sides of the monitor/screen, 34 per cent kept Above the Monitor/screen and 20 per cent kept Between Monitor/screen and Keyboard.

Table 9 Body Posture during using desktop/Laptop

Posture	Yes (%)	No (%)	Total
Thigh horizontal	192(64)	108(36)	300
Feet on floor or on foot rest	192(64)	108(36)	300
Lower leg kept vertical	198(66)	102(34)	300
Arms and forearms at right angle	192(64)	108(36)	300
Wrist rest on keyboard	210(70)	90(30)	300

Table 9 reveals that body posture during using desktop/laptop. Majority of respondents respond that they kept Thigh horizontal, Feet on floor or on foot rest, Lower leg kept vertical, Arms and forearms at right angle and wrist rest on keyboard.

Chi-Square test

Table 10 Association between suffered /suffering from any musculoskeletal problems due to Computer Usage and years of working on Desktop/Laptop

		3-6 Years	6-9 Years	9-12 Years	12-15 Years	>15 Years	
suffered /suffering from any musculoskeletal problems due to Computer Usage	Yes	18	36	42	78	108	282
	No	6	12	0	0	0	18
Total		24	48	42	78	108	300
Contingency Coefficient (Approx. Sig.).039							

Table 11 indicates the relationship between the existence of computer-related health/musculoskeletal discomfort/pain and years spent using a computer was made on the basis of student's report of Desktop/Laptop use from "Years of working on Computer/Laptop). Chi-square analysis (Contingency Coefficient=.499) showed that the correlation between health related/ musculoskeletal discomfort/pain and the reported years of working on computer was significant (p>.05). Therefore, there is association between musculoskeletal problems due to Computer Usage and years of working on computer.

Table 11 Association between suffered /suffering from any musculoskeletal problems due to Computer Usage and years of working on Desktop/Laptop

		hours of work on Computer/Laptop					
		0-2 Hours	2-4 Hours	4-6 Hours	6-8 Hours	8+ Hours	Total
suffered /suffering from any musculoskeletal problems due to Computer Usage	Yes	18	78	60	24	30	228
	No	42	30	0	0	0	72
Total		78	108	60	24	30	300
Contingency Coefficient (Approx. Sig.) .014							

The relationship between the existence of computer-related musculoskeletal discomfort/pain and time spent using a computer was made based on student's report of Desktop/Laptop use in a "typical" day (0-2 hours/day, 2-4 hours/day, 4-6 hours/day, 6-8 hours/day or 8+ hours /day). Chi-square analysis (Contingency Coefficient=.014) indicated that the correlation between health related/musculoskeletal problems and the reported number of hours per day of computer use was significant (p>.05). Therefore, there is association between problems due to computer usage and hours of work on computer.

Table 12 Independent Samples t-Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Finger pain, wrist & hand pain	Equal variances assumed	.027	.870	-.110	102	.913	-.02564	.23313	-.48806	.43677
Shoulder, Elbow pain & arms pain	Equal variances assumed	.462	.498	.174	102	.862	.03846	.22053	-.39896	.47588
Numbness/tingling over hand	Equal variances assumed	.476	.492	.851	102	.397	.17949	.21083	-.23869	.59767
Neck pain	Equal variances assumed	.006	.939	-.517	102	.606	-.11538	.22323	-.55816	.32739
Back pain	Equal variances assumed	.000	1.000	-.481	102	.632	-.11538	.24009	-.59161	.36084
Lower backache	Equal variances not assumed	.215	.022	-2.438	56.166	**.012**	-.44872	.17313	-.79552	-.10192
Leg pain	Equal variances assumed	1.132	.290	.652	102	.516	.14103	.21622	-.28784	.56990
Thigh pain	Equal variances assumed	.006	.940	-.064	102	.949	-.01282	.19908	-.40770	.38206
Knee pain	Equal variances assumed	.100	.753	-.937	102	.351	-.21795	.23259	-.67929	.24340
Numbness/tingling over feet	Equal variances assumed	.000	.998	.220	102	.827	.05128	.23346	-.41179	.51435
Burning feet	Equal variances assumed	1.181	.280	1.294	102	.199	.29487	.22789	-.15714	.74689

Table 12 (i) Group Statistics

	Gender	N	Mean	Std. Deviation	Std. Error Mean
Lower backache	Male	138	1.5769	.70274	.13782
	Female	162	2.0256	.92546	.10479

Table 12 shows that H0 (3) is rejected partially in case of "Lower backache" significance value is less than 0.05($p<0.05$). As table 12 (i) show mean value of female respondents is more than male counterparts so it can be said female are suffering more from Lower backache as compared to their male counterpart respondents.

Table 13 Independent t –test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Shoulder, Elbow pain & arms pain	Equal variances assumed	1.213	.276	.402	48	.690	.20652	.51398	-.82689	1.23994
Numbness/tingling over hand	Equal variances assumed	.605	.440	-.723	48	.473	-.33696	.46627	-1.27445	.60053
	Equal variances assumed	2.301	.136	-.535	3.251	.633	-.33696	.64194	-2.29347	1.61956
Neck pain	Equal variances assumed	2.301	.136	.855	48	.397	.44565	.52123	-.60234	1.49365
Back pain	Equal variances assumed	1.811	.185	-.399	48	.691	-.21739	.54427	-1.31172	.87694
Lower backache	Equal variances assumed	.295	.589	-.323	48	.748	-.17391	.53790	-1.25544	.90761
Leg pain	Equal variances assumed	6.800	.312	.212	48	.833	.10870	.51284	-.92243	1.13982
Thigh pain	Equal variances assumed	1.002	.322	1.298	48	.200	.67391	.51916	-.36092	1.71775
Knee pain	Equal variances assumed	1.642	.436	1.480	48	.143	.79348	.53200	-.27799	1.86495
Numbness/tingling over feet	Equal variances assumed	.565	.456	.247	48	.806	.13043	.52786	-.93089	1.19176
Burning feet	Equal variances assumed	.313	.579	-.534	48	.596	-.27174	.50880	-1.29475	.75127

Table 13 indicates **that** p>0.05 so **H0 (4) is not rejected** therefore, **There is no difference** in Health related problems/Musculoskeletal discomforts between desktop users and Laptop users.

Discussion and Findings

- Majority of respondents were female, graduate and fall in 20-25 years age group, use desktop and work on computer 2-4 hours and take at least once a hour break during working on computer.
- There is association between **musculoskeletal problems due to Computer Usage** and years of working on computer.
- There is association between **musculoskeletal problems due to Computer Usage** and hours of working on computer.
- Health related problems/Musculoskeletal discomforts are independent of Gender except lower back pain which is more in females.
- **There is no difference** in Health related problems/Musculoskeletal discomforts between desktop users and Laptop users.

Recommended Ergonomics for Staying Comfortable At Computer

- Sit up tall.
- Sit close to your keyboard.
- Adjust the keyboard height.
- Adjust the tilt of your keyboard based on your sitting position.
- Position the source documents in front of you, and use an in-line copy stand.
- Take small breaks during your workday to release some muscle tension.

References

Karen Jacobs (2002), "Middle School Children and Their Use of Interactive Media", The Proceeding of the XVI Annual International Occupational Ergonomics and Safety Conference '2002

Sotoyama, M., Bergqvist, U., Jonai, H. and Saito, S. (2002), " An ergonomic questionnaire survey on the use of computers in schools" *Industrial Health*,40, 35-141. http://dx.doi.org/10.2486/indhealth.40.135

Ketola, R., Toivonen, R., Hakkanen, M., Luukkonen, R., Takala, E. and Viikari-Juntura, E. (2002) Effects of ergonomic intervention in work with video display units, *Scandinavian Journal of Work*, *Environment & Health*, **28**, 18-24. http:// dx. doi. org/ 10.5271/ sjweh.642

S. McMahan & R. Lutz (2003), "Computer Use, Workstation Design Training and Cumulative Trauma Disorders in College Students", *Californian Journal of Health Promotion*, Volume 1, Issue 4, 38-46.

Eric B. Schlossberg, Sandra Morrow, Augusto E. Llosa, Edward Mamary, MS, Peter Dietrich, and David M. Rempel, (2004), "Upper Extremity Pain and Computer Use Among Engineering Graduate Students", *American Journal Of Industrial Medicine* 46:297–303.