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Evaluating ergonomic practices and their effect on health of computer users at DRPCA Pusa Bihar

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Abstract

Introduction: Now a day a large number of populations was using computer for their daily activities, which leads to increase in the number of users complaining about various musculoskeletal problems.

Objective: To study the socio-economic profile and to determine the effect of computer usage on health of the users.

Materials and Methods: A pre structured questionnaire was prepared to collect all the information of computer users working in DRPCA campus. The questionnaire covered socio-economic profile of users and various health related problems faced by the computer users.

Results: All the computer users (100%) had taken break from the computer work as they had felt tired after working for a long time. Gender and family size of the computer users were positively significant, while work environment of the users was negatively significant with the effect of computer usage on the health of computer users at 0.05 significant level ($t=1.671$). Age, education, occupation and income were highly significant with the effect of computer usage on the health of computer users at 1 per cent significant level ($t=2.39$).

Conclusion: The nature of work on computer is sedentary type and it increases the static body stress due to inadequate workplace dimensions, hence the users develop different health impact, which affect the efficiency of the computer users.

Keywords: Computer users, musculoskeletal problems, work environment, health

Introduction

Globally the increasing sedentary behaviour of people is one of the major public health concerns. Computer is an integral part of human life. The dependence on computer is now increasing, which widespread use has raised some important health related issues (Khan et, al. 2012) ^[9]. 90 million of people worldwide use computer per day (Sen and Richardson, 2002) ^[15]. Sitting for a long period of time and physical inactivity are the major cause of increasing health risks among the computer users. Most of the people using computers are unaware about the disadvantage and effect of computer use. Working long hours with the computer may cause musculoskeletal disorders (MSD) due to incorrect postures, repetitive strain injuries, occupation overuse syndrome, trauma disorders, muscles stiffness, joint pain and eyesight problems.

The use of computer is helpful as well as harmful as the use of computer is increasing day by day, it also increases the risks related to human health. However the risks related to use of computer varies with gender, time spent in the computer, human health status and the postures used by the users (Reema, 2018) ^[14].

Musculoskeletal problems are significant burdens on users. The term musculoskeletal disorders encircle inflammatory and degenerative conditions, which affect the tendons, muscles, joints, ligaments, blood vessels and peripheral nerves with pain or discomfort and ache. It is the most

common work related problem in the present era.

Static sitting posture for extended period of time causes stiffness and pain in joints. It initiate the contraction in neck muscles which results in neck pain, upper limb pain and back pain (Amin et, al., 2016) ^[1]. Musculoskeletal injuries increase with longer hours of works performed with computer. The computer screen may cause musculoskeletal injuries as it is kept too high or low in relation to the computer user (Kumar et al. 2018) ^[10]. The user adjusts him or her to find a position to see the computer screen, which lead to poor working posture. User's posture is the source of muscular fatigue and discomfort while working with computer.

Excluding the physical factors of user, environmental factors like temperature, light intensity, humidity also affect the works of the users (Gupta 2012) ^[6]. According to Occupational Safety and Health Administration (OSHA, 2004) ^[12] work furniture and related equipment such as desk, chair and work surface can be uncomfortable to the user which may result to awkward position. Job stress and demand of computer user leads to risky physical and cognitive work related processes, which may be due to adoption of awkward posture and lack of break in working hours. Muscle fatigue is the important factor which results in musculoskeletal disorder (MSD).

Worldwide, around 60 million computer users faced discomfort from computer vision syndrome. Computer

vision syndrome is the most common complaint by the computer users. Almost 45 million of users utilize computer by watching continuously at the screen for hours (Ghufran *et. al.* 2020) [5]. According to International Organization for Standardization (ISO) parameters such as sitting postures, monitor position, requirement of seating, arm rest, back rest, leg space and workspace are the suggested standards, which guide to design a computer work station.

Materials and Methods

Sixty computer users were selected for the study, who were working at DRPCAU campus, Kendriya Vidyalaya and Block Office, Pusa of Samastipur District of Bihar. Out of 60 respondents, half male and half female computer users were selected purposively, who were working with computer more than 4 hours.

A pre- structured questionnaire was developed to gather information and self- observation technique and was also used to evaluate information related to the condition of work environment. Field survey was accomplished in following step by step procedure.

Results

Personal characteristics

Gender: It is obvious from the mentioned Table 1 that half of the computer users were male and half were found to be female. In this scenario, the study's results are attributed to the fact that fifty percent of the samples were taken on purpose for both male and female subjects.

Age: The data in Table 1 shows that the majority of computer users (48.33%) were in the age group (20-30 years), followed by 43.33 per cent in the age group (30-40 years), and 8.34 per cent in each of the age group (40-50 years) and (50 years and above).

Education: In terms of respondent educational levels, Table 1 indicates that three-quarters (75.00%) of the respondents were postgraduates, followed by graduate (23.33%) and intermediate respondents (1.67%).

Family size: Data pertaining to family size of the respondents indicated that more than fifty per cent of computer users (68.33%) were belonging to joint family, while the belongingness of nuclear family accounts for 36.67 per cent of all households.

Table 1: Distribution of Computer Users as per the socio-economic characteristics N=60

S. No.	Particulars	Frequency	Percentage
Gender			
i.	Male	30	50.00
ii.	Female	30	50.00
Age			
i.	Below 20 years	-	-
ii.	20-30 years	29	48.33
iii.	30- 40 years	26	43.33
iv.	50 years and above	5	8.34
Education			
i.	Up to Matriculation	-	-
ii.	Up to Intermediate	1	1.67
iii.	Up to Graduation	14	23.33
iv.	Post Graduation and above	45	75.00
Family size			
i.	Joint	38	63.33
ii.	Nuclear	22	36.67
iii.	Extended	-	-

Computer profile

Duration of Computer Use: It was observed that majority of respondents (60%) were working on their computer for 5-6 hours for performing their official work. This was followed by the least number of respondents (38.33%) who had usually worked for more than 7 hours and only a few (1.67%) were working for 3-5 hours.

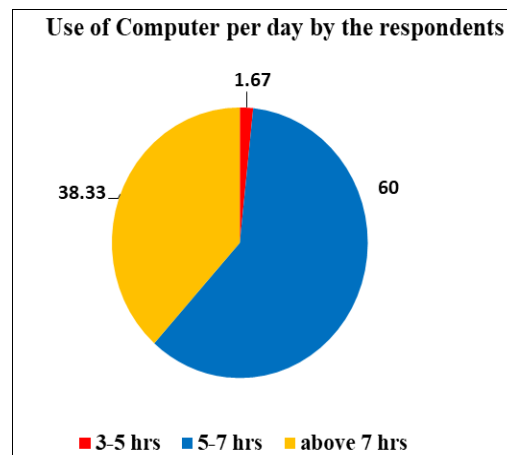


Fig 1: Distribution of computer users as per the use of computer per day

Break from computer: It is observed from the study that all the computer users (100%) had taken break from the computer work as they had felt tired after working for a long time.

Size of the Computer Screen: Regarding the size of the computer screen, it is seen that 48.33 per cent of the computer users were using 14 inch size of the computer screen followed by the respondents who were using computer of various size i.e. 14.5 inch (31.66%), 15 inch (5%), 19 inch (5%) and 21 inch (3.33%). Only 1.67 per cent of the users were using 11inch, 17inch, 18 inch and 18.5 inch computer screen.

Use of spectacles: It can be seen from the table that maximum number of computer users (53.33%) were using spectacles as they were suffering from vision problems.

Table 2: Distribution of Computer Users on the basis of their work profile. N =60

S. No.	Particulars	Frequency	Percentage
Break			
i.	Yes	60	100.00
ii.	No	-	-
Computer screen (Inch)			
i.	11	1	1.67
ii.	14	29	48.33
iii.	14.5	19	31.66
iv.	15	3	5.00
v.	17	1	1.67
vi.	18	1	1.67
vii.	18.5	1	1.67
viii.	19	3	5.00
ix.	21	2	3.33
Spectacles			
i.	Yes	32	53.33
ii.	No	28	46.67

Angle between eyes of the user and computer screen

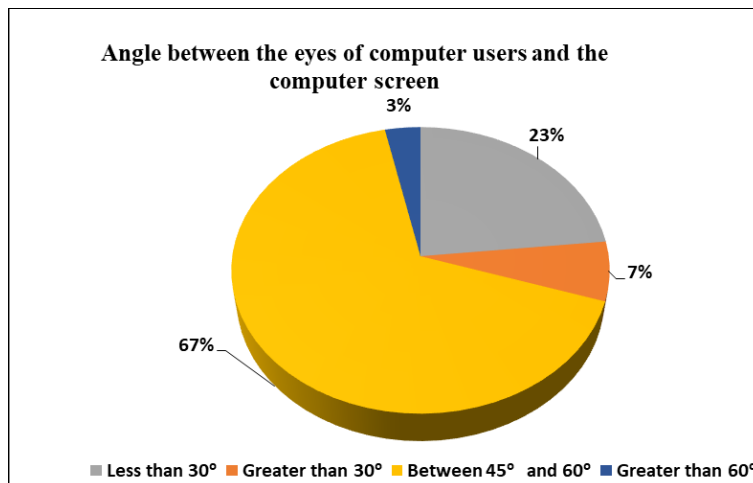


Fig 2: Distribution of computer users according to the angle between the eyes of computer users and the computer screen

From the Figure No. 2 it was resulted that most of the computer users (66.67%) were working at an angle (45° - 60°), while 23.33 per cent respondents had worked at an angle less than 30°. 6.67 per cent respondents had placed their computer screen at an angle greater than 30°.

Effect of computer usage on the health of the users

Computer users work with the computer for long hours of time. They work in a constant posture to get the productivity. As they perform their work in sitting posture for a long time. Hence not only they slowly develop the chronic illness a lot but also suffer from a lot of different diseases and also psychological disturbances. Height, weight and BMI are the parameters of physical characteristics which reveal the health impacts (Brink *et al* 2014)^[2].

Height: It is reported that 38.33 per cent of the users were in the height category of 160-170 cm followed by thirty five per cent of the computer users had height of 150-160 cm. It was also observed that only 21.67 per cent of the computer workers belonged to the body height of above 170 cm.

Age: It was found that 33.33 per cent of the computer users belonged to the category of 50-60 kg and 60-70 kg, whereas 26.67 per cent of the computer users had body weight of above 70 kg. Only few of the users (6.67%) were in the category of body weight 40-50 kg.

Body Mass Index (BMI): Body mass index (BMI) was calculated by using the body height and body weight of the computer users (WHO, 2020)^[17]. It is disclosed from the table that more than half of the computer users (63.33%) had normal BMI, while 26.67 per cent of them were under the overweight category.

Health Checklist of difficulty faced by the respondents

From the Table 3 it is depicted that according to the problems faced by the computer users, while using computer, more than half of the respondents (53.33%) had sometimes felt uncomfortable with the temperature and 46.67 per cent of the computer users were always feeling

uncomfortable with the temperature (mean score 2.46).

Pain in fingers while typing sometimes felt by the computer users (53.33%), while 35 per cent of the respondents had always experienced pain in fingers and 11.67 per cent had never felt pain in fingers, while working on keyboard (mean score 2.23).

Computer users performed their work by sitting in front of the computer for long hours continuously. So the respondents (66.67%) sometimes developed buttock pain and 21.67 per cent had always pain in their buttock due to sitting in chair for a long time (mean score 2.1).

Glare present on the screen of the computer leads to burning sensation in eyes. Eye strain, dry eyes, eye watering are the results of burning sensation of eyes. It is observed that 2.01 were the mean score of burning sensation in eyes among the computer workers. Continuous staring at the computer screen may cause dryness in eyes. Dryness in eyes were the common problem faced by the computer users (mean score 2.01).

VDT users generally suffered from neck pain. Computer users always felt neck pain (mean score 1.91). Computer workers always felt backache while working with computer (mean score 1.88). Computer users were suffering from backache problem as they worked long time without taking breaks. Pain in knees was experienced sometimes by the respondents (mean score 1.85).

Double vision problem was faced by the computer workers as they continuously worked in front of the computer screen (mean score 1.81). Pain in upper back was felt sometimes by the users due to the incorrect body posture of the respondents (mean score 1.75). Lack of concentration was experienced sometimes by the VDT users (mean score 1.75). The head of the computer users sometimes got down, while working with computer for a long time (mean score 1.73).

Continuous reflection of light from screen caused sometimes blurred vision, irritation in work and watering in eyes (mean score 1.63 and 1.6). Due to this they suffered from headache (mean score 1.5). Watering in eyes because of screen was sometimes felt by the computer users because of reflection of the glare from the computer screen (mean score 1.6). The posture adopted to work with computer is

sitting posture. Users performed their work by sitting on the chair for a longer period, which resulted in buttock pain (mean score 1.45)

Respondents reported minor pain in the shoulder, upper arm, fingers, knees, cervical part, wrist, hand, tingling in

fingers and feet, stiffness in fingers, cramping in fingers, and numbness in legs, while using the computer. They had no complaints about pain in eyes where they worked because they were comfortable at the computer workplace.

Table 3: Distribution of computer users as per the effect of computer usage on their health N=60

S. No	Statements	Always (3)	Sometimes (2)	Never (1)	Mean Score
		F (%)	F (%)	F (%)	
1.	I feel pain in neck.	4 (6.67)	47 (78.33)	9 (15.00)	1.91
2.	I feel pain in shoulder.	3 (5.00)	20 (33.33)	37 (61.67)	1.43
3.	I feel pain in wrist.	1 (1.67)	7 (11.67)	52 (86.67)	1.15
4.	I feel pain in hand.	1 (1.67)	12 (20.00)	47 (78.33)	1.23
5.	I feel pain in fingers.	1 (1.67)	20 (33.33)	39 (65.00)	1.36
6.	Watering in eyes because of screen.	3 (5.00)	30 (50.00)	27 (45.00)	1.6
7.	Pain in eyes.	4 (6.67)	43 (71.67)	13 (21.67)	1.85
8.	I feel double vision while reading from screen.	4 (6.67)	41 (68.33)	15 (25.00)	1.81
9.	Numbness in legs.	1 (1.67)	1 (1.67)	58 (96.67)	1.05
10.	Feel pain in knees.	1 (1.67)	19 (31.67)	40 (66.67)	1.35
11.	Feel pain in fist of hand.	1 (1.67)	11 (18.33)	48 (80.00)	1.21
12.	Tingling in fingers and feet.	2 (3.33)	11 (18.33)	47 (78.33)	1.25
13.	Feel backache while working with computer.	1 (1.67)	51 (85.00)	8 (13.33)	1.88
14.	Eyes get blurred and irritated during work.	2 (3.33)	34 (56.67)	24 (40.00)	1.63
15.	Head gets down while working on computer.	1 (1.67)	42 (70.00)	17 (28.33)	1.73
16.	Feel headache while reading from computer screen.	4 (6.67)	22 (36.67)	34 (56.67)	1.5
17.	Pain in buttock for sitting for a long period.	1 (1.67)	25 (41.67)	34 (56.67)	1.45
18.	Pain in the cervical part of the body.	1 (1.67)	10 (16.67)	49 (81.67)	1.2
19.	I feel stiffness in fingers while typing in keyboard.	1 (1.67)	11 (18.33)	48 (80.00)	1.21
20.	Feel cramps in the fingers.	1 (1.67)	4 (6.67)	55 (91.67)	1.1
21.	Feel pain in buttock.	13 (21.67)	40 (66.67)	7 (11.67)	2.1
22.	Lack of concentration in work.	-	45 (75.00)	15 (25.00)	1.75
23.	Sore eyes.	-	-	60 (100.00)	1
24.	Dryness in eyes.	8 (13.33)	45 (75.00)	7 (11.67)	2.01
25.	Pain in upper back.	7 (11.67)	31 (51.67)	22 (36.67)	1.75
26.	Pain in upper arm.	-	25 (41.67)	35 (58.33)	1.41
27.	Pain in fingers while typing.	21 (35.00)	32 (53.33)	7 (11.67)	2.23
28.	Burning sensation in eyes.	8 (13.33)	45 (75.00)	7 (11.67)	2.01
29.	Uncomfortable with temperature.	28 (46.67)	32 (53.33)	-	2.46
30.	Pain in knees.	13 (21.67)	25 (41.67)	22 (36.67)	1.85

Table 4: Correlation between the Effects of computer usage with the selected Independent Variables N= 60

Variable	Correlation co-efficient "r"
Gender	0.26*
Age	0.36**
Education	0.32**
Occupation	0.32**
Family Size	0.25*
Income	0.36**
Work Environment	-0.24*

*Significant at 0.05 level **Significant at 0.01 level

An analysis of the data expresses that there was significant relation between the independent variable and the effect of computer usage on the health of the users. The independent variables like gender, family size and work environment of the users were found to be significantly correlated with the effect of computer usage on the health of the users. That means, if the value of gender increases, the effect of computer usage on the health of the users also increase.

Age, education, occupation and income of the computer users were found to be highly significant with the effect of computer usage on the health of the users. It reveals that by increasing the age, education, occupation and income of the

computer users, the effect of computer usage on the health of the users will also increase. It indicates that, higher the age, education, occupation and income of the computer users, higher will be the workload related to the computer, which increased the effect of computer usage on the health of the users.

Work environment of the computer users was found to be significant and negatively correlated with the effect of computer usage on their health. It reveals that if the value of work environment decreases, the effect of computer usage on the health of the users will increase. Lower the condition of work environment, higher the effect of computer usage on health of the users and vice-versa.

Discussion

Gender: This finding is quite similar to (Moom, 2015) ^[11] who conducted his study between male (60%) respondents and female (40%) respondents.

Age: The results were in consonance with (Gupta, 2012) ^[6] noted that 41 per cent of the computer users belonged to the age group 31-35 years, 28 per cent belonged to the age group 36-40 years and 26 per cent of the computer users came under the age group of 26-30 years.

Education: The results were contradictory to the study of (Kaur, 2014) ^[8] who divulged that more than half of the respondents were post graduates followed by graduate and intermediate.

Duration of Computer Use: The results were quiet contradictory to the study of Heidari *et al.* (2019) ^[7], who divulged that 75 per cent of the young groups were using laptop more than 1 hour per day and 43 per cent of the respondents had used more than 3 hours per day, while 27 per cent had utilized more than 5 hours per day. It was also revealed by the study of Dubey *et al.* (2019) ^[4] that 55 per cent of computer workers worked more than 7 hours per day.

Break: The findings of the study were little far from the study of Dessie *et al.* (2018) ^[3], who noted that 273 (45.0%) were using computer for more than 4.6 hours in a day, whereas 266 (43.8%) of the participants, who were working for more than 5-7 hours and 214 (35.3%) of the computer users were taking regular break, while working with computer.

Angle between eyes of the user and computer screen: According to Shikdar (2007) ^[16], 15°C-30°C is the viewing angle for a computer user. Visual strain is influenced by place of video display terminal relative to eye. The heights of the visual object related to the eyes and the distance of viewing from the eyes to the screen are the two main parameters of VDT position. Ranasinghe *et al.* (2016) ^[13] observed in the study that 35 per cent of the respondents placed their upper edge of the computer screen at the eye level.

Conclusion

Revolution of contemporary technology has made human life very much convenient. So that it is very difficult for the people to imagine their life without computer, laptop, internet, mobile phones and different electronic gadgets. Millions of people worldwide are using computer in their daily life. Computer help the users to enhance their output and productivity as well as it has adverse effect on the health of the users as they use computer for a long period of time. Computer related health problems are gradually increasing day by day, as they perform their work in front of the computer more than 7 hours per day. Appearance of musculoskeletal problems is associated with the insufficient break and shortage of time to break from the computer. Glare present on the computer screen is another major factor to cause to vision problems. So the findings of this study will be helpful to decide the duration of work on computer. So that it can reduce the musculoskeletal disorders and vision problems.

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