CURRENT PRACTICE OF COMPUTER AND RELATED HEALTH PROBLEMS: A STUDY OF SAMTSE COLLEGE OF EDUCATION (SCE) OFFICE STAFF BASED ON ERGONOMICS

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ABSTRACT

In recent years, computers have gained popularity among office staff of Samtse College of Education (SCE) for the purpose teaching and administrative activities. Some staff exhibited strain or injuries such as eye strain, backache, and neck pain as a result of incorrect positioning and repetitive movements. Therefore, cross-sectional descriptive study was carried out from August 23\textsuperscript{rd} to September 5\textsuperscript{th}, 2017 to examine current practice of computer and related health problems among college staff, based on ergonomics. A borrowed, content validated, and constructed questionnaire was used for data collection. A total of 44 office staff participated in this study out of 60 office staff. The office staff were then separated into two groups according to their workplace, namely as teaching staff and support staff. Current practice of computer’s usage was ergonomically improper. Prolonged usage in improper posture has created certain associated health problems. This study indicates SCE office staff are exposed to certain ergonomic hazards and associated health problems. There is a need to create awareness of computer ergonomics practice to improve the current practice of computer’s usage and to minimize health related problems among staff of SCE.

Keywords: Ergonomics; Office Staff; Teaching Staff; Support Staff

INTRODUCTION

Samtse College of Education (SCE) is one of the premier teacher training institutes in the country of Bhutan which was instituted by the third Druk Gyalpo in 1961 with the vision to produce good quality of education [1]. Now 100\% of the office staff have computer either desktop or laptop to work in their office [2]. SCE staff spend many hours in front of a computer during office hours on a daily basis carrying out academic and administrative tasks. Strain injuries such as eye strain, back pain, etc as a result of incorrect positioning and repetitive movements are increasing in the staff of SCE, causing health injuries to staff. Some of the staff even took safety measures by wearing computer glasses while using computer and laptops during office hours. The question to be asked is, are the staff aware of ergonomics of computer uses? Computer ergonomics is a field of
study which aims to reduce the effects of working at a computer for an extended period of time by improving the placement of computer monitor, desk, keyboard as well as accessories that can be used [3]. Among the computers, laptop computers are found to be not ergonomically designed for prolonged use because of the monitor and keyboard that are close together where they cannot both be in a good position at the same time [4]. For instance, the study concluded that current practice of laptop usage was ergonomically improper posture and has created various musculoskeletal problems among medical students [5]. Similarly, another study indicated that “syndrome in patients with bone and muscle is associated with the placement of the pointing device and the position of leg while working [6]”. In addition, another study also indicated that 52.6% of the staff had some kinds of musculoskeletal symptoms and disorders; the greatest complications were on the neck and back discomfort caused by working with improper working tools [7]. People’s health and wellbeing are the country’s topmost priority and are valued as the country’s treasure by the King, government and people [8]. In line with national priority, promoting a culture of wellbeing in college is also given paramount importance. So, there is a need for such studies in order to examine current ergonomics practice and health related issues of staff in SCE.

Therefore, the main objective of the study was to examine current practice of computer and related health problems among college staff, based on ergonomics. This study had addressed the following questions:

1. What are the current practices of computer among college staff?
2. Is there a statistically significant relationship between type of staff and amount of time spent on the computer in their office during average work days?
3. Is there a statistically significant difference between teaching staff and support staff in terms of health concerns?

METHODOLOGY

A quantitative method using cross-sectional descriptive study was conducted from August 23rd to September 5th in 2017, among SCE staff who uses computer in their office. Random sampling method was used for the selection of participants from the population. All the staff who uses computer in the office within the college campus were included as study subjects. Study subjects were invited through common email id staff.sce@rub.edu.bt to fill in online survey questionnaire designed using Google forms. Data were collected online through questionnaires designed in Google forms. The questionnaire included details about demographics, type of computer uses, details regarding how computer were used, computer users’ behaviours and working posture while using computer in their office and experiencing any health concerns that are believed to be related to
work with the computer and any safety measures. Question concerning computer user’s behaviours and working posture had nine items presented using Likert scale (1-5) indicating the level they behave i.e. never, rarely, sometimes, often, and always. Question concerning health concerns related to computer had twelve items presented using Likert scale (1-4) indicating the level of discomfort, i.e. no discomfort, slight discomfort, moderate discomfort and significant pain. The items were framed by referring the items developed by Inmor et al. and University of Delaware [6, 9].

The data collected form the survey was entered into the SPSS 22 for statistical analysis. Descriptive and frequency analysis were used to summarize the demographic information and type of computer use by the staff. A chi-square analysis was used to check whether there was a statistically significant relationship between type of staff and amount of time spent on the computer in their office during average work days (α=0.05). The independent sample t-test was used to check whether there was a statistically significant difference between teaching staff and support staff in terms of health concerns (α=0.05).

RESULTS

Demographics Characteristics

Total of 44 staff participated out of 60 computer using staff, which constitutes of dominantly male (n=33). Mostly the participants were from age less than 30 years (n=14) or more than 40 years (n=19) which makes up of number 33 (75%) of the sample population. In terms of usage of computer only number 5 (11.5%) of the participants were using the computers less than 4 years, rest of the participants were using the computers for more than decade. The staff were separated into two groups according to their workplace, namely as teaching staff and support staff. 29 (65.9%) of the participants were from teaching staff and another 15 (34.1%) of them were from support staff.

Type of Computer Use by the Two Groups

Table I shows the type of computer use in the office by the two groups. There were 25 (96.2%) teaching staff using laptop and 11 (84.6%) of the support staff using desktop. This concludes that mostly laptop users were teaching staff and desktop users were support staff and only few staff were using both types of computers in their office.
Computer Users’ Behaviours of the Two Groups

Table II contains an array of indicators used to evaluate behaviours and working posture of the two groups while using computer in the office.

The means for the support staff were higher than the teaching staff while SDs were higher for the teaching staff than support staff for the items v and vii. It indicated that support staff switch more between computer tasks that uses different motions and took more effort to adjust chair position while compared to teaching staff. It also shows that the scores for the support staff had lesser variability compared to the scores of the teaching staff.

For items i, iii and iv, both the mean and SD for the support staff were higher than teaching staff. This indicated that support staff pay more attention to working posture, took more 2-5 minutes break to move around every 30-60 minutes and took more (10-20 second) break at least every 10 minutes than the teaching staff. In contrast, the scores showed that support staff had higher variability compared to the scores of teaching staff.

However, means for the teaching staff were higher than the support staff while SD were higher for the support staff than teaching staff for the items viii and ix. This indicated that teaching staff took more effort to adjust monitor position approximately at eye height and an arm away and took more effort to position any additional equipment in access while compared to support staff. It also showed that the scores for the teaching staff had lesser variability compared to the scores of the support staff.

For items ii and vi, both the mean and SD for the teaching staff were higher than teaching staff. It indicated that teaching staff took more rest because of discomfort and took more effort to adjust external keyboard position than support staff. However, the scores showed that teaching staff had higher variability compared to the scores of support staff.

The result also showed that there was an effort to improve the computer ergonomics practice by both the groups, but the means scores were not in higher side of the five-points Likert scale. So, in general, there was not a good sign of computer ergonomics practice by the staff of SCE.
| Items                                                                 | Type of staff | Statistic | Std. Error |
|----------------------------------------------------------------------|---------------|-----------|------------|
| i. Pay attention to working posture                                  | Teaching      | Mean 2.92 | .215       |
|                                                                      | Support Staff | Std. Deviation 1.077 | .312     |
|                                                                      |               | Mean 3.54 |            |
|                                                                      |               | Std. Deviation 1.127 |          |
| ii. Take a rest because of discomfort                                | Teaching      | Mean 3.12 | .167       |
|                                                                      | Support Staff | Std. Deviation .833 | .226     |
|                                                                      |               | Mean 3.00 |            |
|                                                                      |               | Std. Deviation .816 |          |
| iii. Take a short (10-20 second) break at least every 10 minutes     | Teaching      | Mean 2.80 | .245       |
|                                                                      | Support Staff | Std. Deviation 1.225 | .398     |
|                                                                      |               | Mean 2.69 |            |
|                                                                      |               | Std. Deviation 1.437 |          |
| iv. Take a brief (2-5 minutes) break to stretch and/or walk around every 30-60 minutes | Teaching | Mean 2.72 | .248       |
|                                                                      | Support Staff | Std. Deviation 1.242 | .366     |
|                                                                      |               | Mean 3.08 |            |
|                                                                      |               | Std. Deviation 1.320 |          |
| v. Switch between computer tasks that uses different motions         | Teaching      | Mean 2.60 | .191       |
|                                                                      | Support Staff | Std. Deviation .957 |          |
|                                                                      |               | Mean 3.46 |            |
|                                                                      |               | Std. Deviation 6.60 | .183     |
| vi. Take effort to adjust external keyboard position                 | Teaching      | Mean 2.72 | .178       |
|                                                                      | Support Staff | Std. Deviation .891 |          |
|                                                                      |               | Mean 2.31 |            |
|                                                                      |               | Std. Deviation 2.751 | .208     |
| vii. Take effort to adjust chair position                            | Teaching      | Mean 3.36 | .181       |
|                                                                      | Support Staff | Std. Deviation .907 |          |
|                                                                      |               | Mean 3.46 |            |
|                                                                      |               | Std. Deviation .776 | .215     |
| viii. Take effort to adjust monitor position approximately at eye height and an arms distance away | Teaching | Mean 3.12 | .145       |
|                                                                      | Support Staff | Std. Deviation .726 |          |
|                                                                      |               | Mean 2.92 |            |
|                                                                      |               | Std. Deviation .862 | .239     |
| ix. Take effort to position any additional equipment in accessible places | Teaching | Mean 3.04 | .187       |
|                                                                      | Support Staff | Std. Deviation .935 |          |
|                                                                      |               | Mean 3.00 |            |
|                                                                      |               | Std. Deviation 1.000 | .277     |

**Time Spent with Computer in the Office by the Two Groups**

A contingency table analysis was conducted to establish whether there is a significant relationship between two groups in terms of amount of time spent on the computer during an average workday in the office. There was no significant relationship between these two variables as shown in Table III, the Pearson Chi-Square ($\chi^2$) (DF=2, n=44) = 2.497, p>.05, as expected count of all the cells was not different enough form the observed counts. However, it was found that 34.5% of the teaching staff spent six hours and above as compared to 13.3% of the support staff as shown in Table IV.
TABLE III. CHI-SQUARE TESTS

|                              | Value | DF | Asymp. Sig. (2-sided) |
|------------------------------|-------|----|-----------------------|
| Pearson Chi-Square (χ²)      | 2.497 | 2  | .287                  |
| Likelihood Ratio             | 2.671 | 2  | .263                  |
| Linear-by-Linear Association | .902  | 1  | .342                  |
| N of Valid Cases             | 44    |    |                       |

a. 2 cells (33.3%) have expected count less than 5. The minimum expected count is 4.09.

TABLE IV. AMOUNT OF TIME SPENT ON THE COMPUTER DURING AN AVERAGE WORKDAY IN THE OFFICE BY THE TWO GROUPS

| Type of staff | How much time do you spend with computer |
|---------------|-----------------------------------------|
|               | 0-4 | 4-6 | 6 & above |
| Teaching Staff| 9   | 10  | 10        |
| Expected Count| 9.2 | 11.9| 7.9       |
| % within Type of staff | 31.0% | 34.5% | 34.5% |
| Support Staff | 5   | 8   | 2         |
| Expected Count| 4.8 | 6.1 | 4.1       |
| % within Type of staff | 33.3% | 53.3% | 13.3% |

Principal Component Analysis on the Health Concerns Items That Are Believing to Be Related to Computer Work in the Office

After deleting all non-performing items and re-running the analysis to produce a refined solution, the final solution for a number of items on health concerns that were believed to be related to computer work produced two valid components as shown below Table V. Component one comprised of five items and component two comprised of four items. The two components accounted for a substantive 70.6% of the variance in the items. Each of the two components correlated moderately strongly to each other as shown in Table VI and each component demonstrated acceptable reliability when the lower limit reduced to .60 as shown in Table VII since the measurement scales have been borrowed and constructed together. Table IV to VII shows a modified version of the table from rotated component matrix with inclusion of correlation and reliability statistics.

TABLE V. ROTATED COMPONENT MATRIX

| Area of discomfort | Component |
|--------------------|-----------|
|                    | 1         | 2         |
| ii. hand, wrist    | .828      |           |
| i. fingers, arms   | .825      |           |
| v. thigh, knee     | .813      |           |
| vi. lower leg      | .795      |           |
| vii. foot, ankle   | .775      |           |
| ix. upper middle back |        | .872     |
| x. lower back      | .857      |           |
| xi. eyes           | .805      |           |
| viii. neck         | .648      |           |

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization*.

a. Rotation converged in 3 iterations.
### TABLE VI. CORRELATIONS BETWEEN TWO COMPONENTS

| Area of discomfort | Hand_legs | Back_eye_neck |
|--------------------|-----------|---------------|
| **Pearson Correlation** | 1         | .508**        |
| Sig. (2-tailed)     |           | .000          |
| N                  | 44        | 44            |
| **Pearson Correlation** | .508**  | 1             |
| Sig. (2-tailed)     | .000      |               |
| N                  | 44        | 44            |

**. Correlation is significant at the 0.01 level (2-tailed).

### TABLE VII. RELIABILITY STATISTICS

| Cronbach's Alpha | Cronbach's Alpha Based on Standardized Items | N of Items |
|------------------|---------------------------------------------|------------|
| .673             | .673                                        | 2          |

### Health Concerns that are Believed to be Related to Computer Work of the Two Groups

Top five body parts reported to suffer the most were eyes (M=3.09, SD=.910), lower back (M=2.70, SD=.734), neck (M=2.64, SD=.780), upper middle back (M=2.57, SD=.818), and upper arm-shoulder (M=2.34, SD=.939) which were all scores between slight discomfort to moderate discomfort.

The independent sample t-test was conducted to see whether there was any difference between the two groups in terms of health concerns. As shown in Table VIII, the mean score of the teaching staff on the variable “Hand_legs” (M=2.20, SD=.670) was not statistically significantly difference (t=1.160, df=42), two tailed (p=.253) than support staff on the same variable (M=1.95, SD=.719). Similarly, mean score of the teaching staff on the variable “Back_eye_neck” (M=2.66, SD=.702) was not statistically significantly difference (t= –1.190, df=42), two tailed (p=.241) than support staff on the same variable (M=2.92, SD=.595). However, both the groups indicated moderate discomfort on their back, eye and neck as the mean scores were in the higher side of the four-point Likert scale.

### TABLE VIII. DIFFERENCE BETWEEN THE TWO GROUPS IN TERMS OF HEALTH CONCERNS

| Area of discomfort | Type of staff   | N  | Mean | Std. Deviation | Std. Error Mean |
|--------------------|-----------------|----|------|----------------|-----------------|
| Hand_legs          | Teaching        | 29 | 2.20 | .670           | .124            |
|                    | Support Staff   | 15 | 1.95 | .719           | .186            |
| Back_eye_neck      | Teaching        | 29 | 2.66 | .702           | .130            |
|                    | Support Staff   | 15 | 2.92 | .596           | .154            |
DISCUSSIONS

Through this study, it was able to examine current practice of computer and related health concerns of teaching staff and support staff of SCE, based on ergonomics. The result of the health concerns that are believed to be related to the computer work of the two groups indicated that there was no significant relation between two groups in terms of health concerns. However, both the groups indicated moderate discomfort on their eye, back, and neck as the mean score were in the higher side of the four-points Likert scale. On the health concerns related to computer work in the office, data indicated that 13 (29.5%) of the participants took ergonomics safety measures such as wearing reading glass, doing body light exercises, not staying too long in front of computer unless have office work and maintain good posture while working.

Additionally, when it was further evaluated the ergonomic safety measures taken of the two groups, it was discovered that 7 (24.1%) of the teaching staff have taken ergonomic safety measures as compared to 6 (40.0%) of the support staff. Multiple studies have found that ergonomic related health problems were associated with: time spent on the computer, workload characteristics, working posture and human behaviour while using computer in their workstation [5, 6, 7, 10]. The result of a computer users’ behaviour of the two groups analysis indicated that there was unlikely of a good computer ergonomics practice by the both the groups since the mean scores of the working posture and computer users’ behaviour items were not in higher side of the five-points Likert scale. Additionally, the result of time spent with computer in the office by the two groups analysis indicated that 12 (27.3%) of the total staff spent beyond office hour time doing range of computer activities from lesson planning to office work.

Theoretically, the prevalence of ergonomic related health problems for the teaching staff should be higher than that of the support staff, owing to the group being laptop users. However, there was no significant difference has been found, which can be explained by multiple reasons. One reason was, in evaluating the computer user’s behaviours of the two groups, it was discovered that, teaching staff took more effort to adjust laptop monitor’s position approximately at eye height and an arms distance away, which reduced the ergonomic related health problems. Another reason was, they took effort to adjust external keyboard position so that the elbows can rest at 90° by the side [4]. On top of that, they took more rest because of discomfort while using computer. This could mean teaching staff taking regular classes during office hours which help them to relax tissues, lubricant joints and prevent stiffness, improve circulation, reduces fatigue, and build stamina [4]. So, these activities had prevented teaching staff suffering more from health injuries related to the computer work than support staff.
LIMITATIONS

A limitation of the study was that the quantitative method using a cross-sectional descriptive study may not have enabled for an in-depth knowledge into the topic. Future researchers may adopt a mixed method design to get a richer data pertaining to the topic. Another limitation was that the study was conducted only in one of the colleges of Royal University of Bhutan (RUB), therefore, the findings may not be generalized to other colleges and other agencies. A large scale study involving all the colleges and other agencies is recommended.

CONCLUSIONS

The findings of the study confirmed that the current practice of computer use by the staff working in the office lead to various associated health problems. The study also confirmed that there was no significant relationship between two groups in terms of time spent in the office. Further, the study also confirmed that there was no significant difference between two groups in terms of health concerns.

Since the SCE office staff are exposed to certain ergonomic hazards and associated health problems, there is a need to create awareness of computer ergonomics practice to: a) improve the current practice of computer’s usage; and b) minimize health related problems among staff of SCE. It is recommended that the relevant stakeholders such as the Ministry of Education (MoE), Colleges of RUB and other agencies may initiate ergonomic interventions by developing computer ergonomic assessment policy and guidelines.

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