Ergonomics and techno stress among library professionals of engineering colleges of Anna University

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Abstract

The degree of computer usage in libraries had been greatly increased in recent decades carrying the risk of several health hazards. The purpose of the present study is to analyse the utilisation and purpose of workspace design and to determine the prevalence of self assessment of physical discomforts to conduct an interventional ergonomic health education program. A study was conducted on library professionals in the engineering colleges of Anna University, Tamil Nadu. A questionnaire was issued among library professionals and consists of 1) Demographic Details and 2) Ergonomics and stress

Keywords: Ergonomics, Techno stress, Librarians

Introduction

Ergonomics is the study of how working conditions, machines and equipment can be arranged in order that people can work with them more efficiently. As computers are probably the most omnipresent type of machine in today's work and learning environments, the issue of ergonomically sound interaction with them has become evident. In general, computers are clean, quiet and safe to use. However, poor interaction with and poor positioning of computer equipment can lead to health problems, such as eyestrain, swollen wrists and backache. Problems can be avoided by good workplace design and by good working practices. Prevention is easiest if action is taken early through effective analysis of each workstation. There are a number of practical steps that can be taken to achieve an ergonomically positive environment and, furthermore, to promote a safer learning environment. These are:

- **Positioning of the person and equipment**: A minimum of 4.65 square meters of floor space for adults is recommended for office or similar environments. Adequate space between workstations should be provided in a computer suite.

- **Arranging a safe learning environment**: This should exclude space taken up by fixtures such as filing cabinets. As computers can generate heat and may need to be re-arranged. In addition, securing and covering trailing cables is necessary for safety reasons.

- **Taking regular breaks**: This may mean leaving the workstation for a few minutes every hour to have a work-break or to engage briefly in some other work-related activity. It will not only allow eye muscles to readjust, but also refresh all body muscles, promoting personal health and a safe learning environment. The library professionals can reinforce the importance of human-computer interaction by following such practices in work place.

Literature Review

Bichteler (1986) focused on techno stress and librarians and found that physical manifestations, such as eye strain and muscoskeletol problems were increasingly being corrected by ergonomics. However it was the psychological aspect which altered work, as people felt they have less control, and perceived greater fatigue. Techno-stress behavior can take the form of vocal disapproval,

passive avoidance, and outright hostility, while techno-centered people over identified with computers. A study conducted for special librarians showed that special librarians were less affected by techno stress than other working groups in that were studied. Word processing had eased document preparation. Librarians thought that their personalities had changed to become more efficient, organised and computer-oriented. The major source of techno stress was inadequate training in hardware and software. Most felt that technology had enhanced their work.

Bichteler (1987) focused on library staff and users. While the great majority of staff is open minded and accepting of new technology, Bichetler reported that there were a minority who were "resistors". Some staff may avoid technology, while others were outright hostile. Reasons for resistance may be due to age, fear of the unknown, job insecurity, performance anxiety and organisational factors. Bichteler gave a list of solutions for management who plan on implementing an automation system. The solutions include involving staff in decisions, communicating with staff about each step and preparing for implementation and hand-holding in the first week that the system goes up. Ergonomics were also a factor in techno stress which should be attended to by management. End-users or clients also experienced techno stress and the library staff needed to be available to help. Bichteler pointed out that end-user education, not just training should include basic information on how to search and subject headings arrangement. Printed instructions in the form of manuals also need to be available for patrons. Staff training was again considered crucial, but Bichteler reported that managers did not heed the advice. Librarians reported that sessions were too brief, or knowledge was assumed of certain systems. The poor quality of the training caused negative attitudes on the part of staff and these attitudes were quickly passed on to patrons.

Quinn (1995) reviewed the techno stress literature of the field. He used both Brod (1984) and Sethi (1986) definitions of techno stress. Quinn highlighted many points, including how on an organisational level, techno stress may affect labour relations and staff morale. Role conflicts, age, lack of control and inexperience with computer systems as well as performance anxiety were some of the root causes of techno stress. Job insecurity due to fear of obsolescence, or displacement, also had a role in computer anxiety. Organisational factors, such as lack of involvement of staff and lack of communication were another cause. Quinn reported that solutions included communication and involvement of staff, a slower implementation process, adequate training and planning. Ergonomics should definitely be a consideration in avoiding the physical side of techno stress. Well-designed

user interfaces, hardware and software standardisation were also cited as ways to reduce and avoid techno stress.

Winstead (1994) examined staff reactions to library automation in three academic libraries covering all library personnel. She administered the survey in 1987 during various phases of library automation, and again in 1993 after the automated system was fully implemented. Both surveys yielded similar findings. The author found that educational level had no bearing on the acceptance of automation, almost all employees welcomed automation and the reason most frequently cited was for faster operations, library staff felt that good communication skills were essential in the implementation of automation, and automation did not cause changes in the hierarchy of the library. Results from both studies also showed that the majority of library personnel were concerned about ergonomic factors. Two effects from computer usage not reported in the 1987 survey were carpal tunnel syndrome and electromagnetic field radiation emitted from the monitor.

According to Harper (2000), there were two forms of techno stress affecting librarians; the physical form and the psychological form. Complaints of headache, back strain, eye strain, repetitive strain injuries such as carpal tunnel syndrome, and muscular dysfunctions were some of the physical forms of techno stress. The psychological forms of techno stress suffered by librarians included feeling drained, information overload, over-identification with technology, under work, and doing routine jobs. In addition, the fear that computers were taking over their roles also led to feelings of job insecurity. There were also feelings of jealousy among librarians when their levels of technology competencies differed and resulted in the loss of motivation and team spirit. Spending so much time working with new technology also gave rise to feelings of job role uncertainty especially when librarians find themselves doing the job of systems librarians.

Objectives

The following are the objectives of the study:

- To study the demographical details of the library professionals of Anna University
- To study the perception of techno stress among the library professionals in Anna University of technology, Coimbatore.

To study the relationship between ergonomics and techno stress based on the perception of library professionals of Anna University.

Definition

Ergonomics is all about proper fit. That is the development and behavioral strategies interfacing with human capabilities (physical, mental and psychological) in order to optimise the human-work relationships (Albin, 1985). It comes from the Greek word "ergo" meaning work, and "nomos" meaning rules and laws**.**

Engineering Colleges of Anna University

Anna University was established on 4 September 1978 as a unitary type of University. It offers higher education in engineering, technology and allied sciences relevant to the current and projected needs of the society. Besides promoting research and disseminating knowledge, it fosters cooperation between the academic and industrial communities. The University was formed by bringing together and integrating two well-known technical institutions in the city of Madras. In the year 2002, Anna University was converted into an affiliated type of University wherein all the government, government aided and self-financing engineering colleges in the state of Tamil Nadu numbering approximately 102 were affiliated to it. Since the number of institutions in the state was continuously rising every year and 240 during 2006, for administrative convenience, Anna University was divided into four separate Universities namely:

- Anna University, Chennai
- Anna University of Technology, Coimbatore
- Anna University, Trichirapalli
- Anna University, Tirunelveli

Methodology

The first part of the questionnaire comprised demographic data of the respondents such as age, gender, educational qualification, total library experience, area of specialisation, type of the institution, nativity, marital status, salary per month. The second part was concerned with ergonomics and stress. The constructed questionnaire was given to subject experts for checking the content and construct validity. Based on their suggestions, changes were made and the questionnaire was distributed to the respondents. The population consisted of librarians and assistant librarians of engineering colleges of Anna University, Coimbatore. Questionnaires were distributed to the library professionals with an explanatory covering letter. The respondents were assured that their identity will remain confidential and the results will not have any negative effect on their institution. Out of a total of 113 questionnaires sent out, 103 were returned but only 98 were found to be suitable in all aspects which was 86% of the population. The collected data were processed and analysed using SPSS software. Chi-square analysis was used to study the significance between the variables. Z value and p value were also identified.

Results

Table 1 and 2 shows the demographic details of the respondents. It has been divided into personal and socio-economic factors of the respondents. There was a total of 98 respondents, with71 males (72.4%) and 27 females (27.6%). Majority were in the age group of 25-34 (52.0%), followed by the age group 35-44 (33.7%). Most of the respondents were married (74.5%) with 24.5% were single and very few respondents were widowed (2.0%). The two largest groups with the total library experience were for 6-10 years (34.7%) and for 1-5 years (33.7%). Majority of the respondents worked in self-financing institutions (87.8%) and in autonomous institutions (7.1%), with 3% in government and 2% in government-aided institutions. About 44% participants were drawing monthly salary below Rs.10,000, and 40% were being paid between Rs.10, 001-20,000. More respondents were from rural area (58%) than the urban area (42%).

Table 1: Personal Demographics of Respondents

Demographic variable	Classification	Frequency	%
Gender	Male	71	72.4
	Female	27	27.6
Age	<25	5	5.1
(in years)	25-34	51	52.0
	35-44	33	33.7
	45-54	8	8.2
	55+	1	1.0
Marital Status	Bachelor/Spinster	23	23.5
	Married	73	74.5
	Divorced	-	-
	Widow	2	2.0
Educational Qualification	Bachelor in LIS	2	2.0
	Other Bachelor Degree	13	13.3
	Masters in LIS	17	17.3
	Other Masters Degree	4	4.1
	M.Phil	54	55.1
	Ph.D.	8	8.2
Educational Qualification (Multiple response)	Bachelors in LIS	12	7.9
	Other Bachelor Degree	20	13.2
	Masters in LIS	38	25.2
	Other Master's Degree	17	11.3
	M.Phil	56	37.1
	Ph.D.	8	5.3
Nativity	Urban	41	41.8
	Rural	57	58.2

Table 2: Demographic Details of Respondents

Demographic variables	**Classification**	**Frequency**	**%**
Total library experience	1-5	33	33.7
	6-10	34	34.7
	11-15	18	18.4
	16-20	6	6.1
	21-25	6	6.1
	26-30	-	-
	31+	1	1.0
Institution type	Govt	3	3.1
	Govt-aided	2	2.0
	Self-financing	86	87.8
	Autonomous	7	7.1
	Deemed to be university	--	--
Salary	Below Rs.10,000	43	43.9
	Rs.10,001-20,000	39	39.8
	Rs.20,001-30,000	11	11.2
	Rs.30,001-40,000	3	3.1
	Rs.40,001-50,000	1	1.0
	Rs.50,001-60,000	--	--
	Rs.60,001+	1	1.0

Hypotheses 1: Ergonomics have no significant influence on techno stress.

It is evident from Table 3 & 4 that hypotheses is rejected (S) in all the cases.

Nearly one third of the participants (75.5%) felt that straight position of head and neck with their back is a must and more than half of the respondents (58%) said that their spine have to be perpendicular to the floor and 56% of the participants said that upper arms and elbows need to be close the body. A maximum of 76.5% told that the input devices are located next to the keyboard and a minimum of 34.7% said that the back rest of the chair is not supporting their lower back.

A maximum of 56.1% of the participants felt that the user with spectacles can read the screen without bending the head and neck backward. A maximum of 69.4% of the respondents felt that light is not reflected on the monitor and nearly one third of the respondents (76.5%) told that the workstation and equipment is adjustable for assuring safe working posture and the computer workstation, components and accessories are maintained properly.

After carrying out a Chi-square analysis, the following hypothesis was framed**.**

Hypotheses 2: The demographic variables have no significant influence on the various ergonomic factors such as working postures, seating, position of the monitor and general (servicing of systems and printer).

It is very clear from the results of Chi-square analysis presented in Table 5 that Nativity alone has significant influence over ergonomic factors relating to General Category of ergonomic factors.

Table 3 Ergonomics and Stress (Working Postures)

Working Postures	Yes (%)	No (%)	Z values	p Values	NS/S
Does your head and neck need to be straight with your back?	74(75.5)	2(21.4)	9.01183	0.0000	S
Does your spine have to be perpendicular to the floor?	58(59.2)	37(37.8)	3.0685	0.0011	S
Do the upper arms and elbows need to be close to the body and not extended outward?	56(57.1)	36(36.7)	2.92322	0.0017	S
Seating (Chair)					
Does the backrest of the chair support your lower back?	60(61.2)	34(34.7)	3.85104	0.0001	S
Does your workstation ensure that your wrists and hands do not rest on sharp or hard edges?	59(60.2)	36(36.7)	3.38651	0.0004	S
Are the input devices located right next to your keyboard so that they can be accessed and used without having to reach them?	75(76.5)	19(19.4)	9.74967	0.0000	S

S - Significant at 5% level, (p value < 0.05); NS - Not Significant at 5% level (p value > 0.05)

Table 4 Ergonomics and Stress (General)

Monitor	Yes (%)	No (%)	Z value	p value	NS/S
Is the top of the monitor screen at or below your eye level?	58(59.2)	35 (35.7)	3.38946	0.0004	S
Can the user with spectacles read the screen without bending the head backward?	55(56.1)	40(40.8)	2.16859	0.0151	S
Do you ensure that light is not reflected on your screen?	68(69.4)	27 27.6)	6.44528	0.0000	S
General					
Does your workstation and equipment have sufficient adjustability?	75(76.5)	21(21.4)	9.24673	0.0000	S
Are your computer workstation, maintained in serviceable condition and does it function properly?	75(76.5)	20(20.4)	9.49428	0.0000	S

S-Significant at 5% level, (p value < 0.05); NS –Not Significant at 5% level (p value >0.05)

Table 5: Chi-Square Values-Personal Factors and Ergonomics

Ergonomic factors / Demographic variable	Working Postures	Seating (Chair)	Monitor	General
Age	1.972	3.084	0.653	2.043
Gender	1.072	1.329	7.801	2.912
Marital Status	8.1	4.981	2.752	5.625
Educational Qualification	10.525	16.916	10.251	6.082
Experience	4.598	5.64	13.502	10.182
Institution Type	10.084	5.88	12.658	15.757
Salary	0.05	0.352	1.392	5.045
Nativity	6.741	9.534	8.326	24.572*

***** Denotes Significant at 5% level

Conclusion

This paper studied the opinions of 98 library professionals working in Anna University, Coimbatore relating to ergonomics and stress. The study found that personal factors of the participants like age, marital status, educational qualification and type of institution where they work have no significant influence on ergonomic factors. It is concluded that ergonomics had significant influence on techno stress and it is suggested that regular breaks are taken if working for a longer period on a computer. The results of this study are consistent with other studies (Harper, 2000 & Kupersmith, 2006). This may mean leaving the workstation for a few minutes every hour to engage briefly in some other work-related activity. Not only will this allow eye muscles to readjust, it will also refresh all of the body's muscles, promoting personal health and a safe learning environment and thereby leads to reinforce the importance of human-computer interaction.

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