AN ERGONOMIC OVERVIEW OF COMPUTER WORK STATION DESIGN

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Abstract— **Extended work with computers can result in the muscular fatigue and discomfort as now a days computers are not only used for office purpose but also for other work. The use of laptops and other accessories lead to the discomfort in operator's posture which is due to the inappropriate design of workstation furniture. This lead to the both kind of muscular as well as visual discomfort. Each worker has its specific task and working efficiency so an optimum design of computer workstation according to the workers physical and mental strength is necessary. This paper deals with the design and layout of computer workstation ergonomically covering each part. The goal of this paper is to offer a practical guide to interpreting published ergonomic guidelines and the anthropometric data that can be used to create a user friendly, ergonomically correct computer work environment.**

Key Words**: muscular fatigue, computer workstation design, VDT.**

I. INTRODUCTION

It should be taken into consideration that any one posture becomes fatiguing after a while, and that changes in posture are important. Also the one posture may be beneficial to one while harmful to other. A CSA guideline is given about the movement in which emphasis is given on to minimize the postural fatigue and discomfort. Movement may include slightly adjusting the positioning of the head, shoulders, arms, back, hips, and legs. [i]

Fig 1

computer workstation design.

The following are the points related to the design of computer workstation-

1) The monitor height should be such that your neck will be straight.

2) Your elbow joints should be at about 90 degrees, with the arms hanging naturally at the sides.

3) Keep your hands in line with the forearms, so the wrists are straight, not bending up, down or to either side.

4) Thighs should be roughly parallel to the floor, with your feet flat on the floor or footrest.

5) If necessary, use a footrest to support your feet.

6) Your chair should be fully adjustable (i.e. for seat height, backrest height and seat pan tilt, and, preferably.

7) Enough space should be provided for the mouse use. The angular wrist movements should be given proper space and height.

8) Use an adjustable document holder to hold source documents at the same height, angle and distance as the monitor.

ll. Monitor Position- operators eye level is one of the major consideration in designing the monitors. [ii]The improper screen height of the monitor may lead to the muscular fatigue of the neck muscles and may also become the cause of visual fatigue.[iii]

III. **Seating Chair-** The size of the worker is an important consideration in buying a chair. Many newer models of chairs come in different sizes to accommodate the variation in user sizes. The height of the chair is such that it allows the worker to rest its feet on the floor. For all this a height adjustable chair is most beneficial.
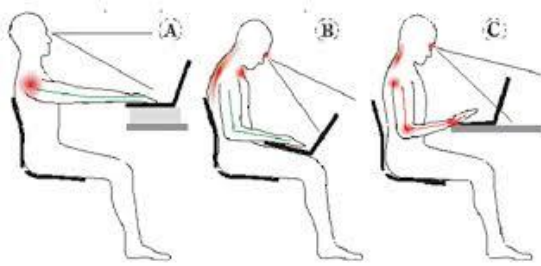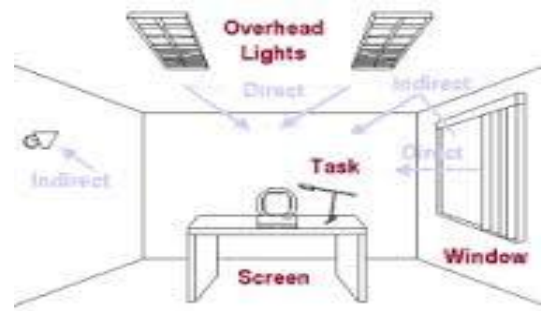
Fig 2. Seating chair

IV. Keyboard height- Keyboards should be placed at a height that allows the operator to operate the keyboard with the forearms level and hands sloping slightly downward. A negatively tilting keyboard, allowing the operator to "keep the wrinkles out of the top of the wrists" is ideal. Fore and aft positioning of the keyboard should be consistent with allowing the hands to move easily over the keyboard. If mouse is also attached to the keyboard it should be placed nearest to the keyboard. The height and tilt of keyboard screen should be user friendly. [iv]

Fig. 3 Ergonomic keyboards.

V. Lighting- Overhead lights, windows, or other light sources may contribute to visual discomfort. It is generally recommended that room lighting for use of computers with dark background screens be lowered to about half of normal office lighting. External sources of light (windows, overhead lights, etc.) should not be in the visual field of the user, nor should their reflections be visible on the screen. Temporarily shield peripheral light sources from view with a file folder. If the light is more it may create glare on the screen. This glare may lead to visual discomfort and fatigue. [v] This glare can be reduced by the use of light absorbing curtains. The light system should focus on the uniformity of the light.

Fig. 4 ergonomic lightning of computer workstation

VI. Task Design- Extended periods of time spent working at computer workstations may contribute to muscular and visual fatigue and discomfort. Maintaining any posture over time is fatiguing, no matter how well the workstation is set up. Also, the work actions in tasks such as continual data entry or word processing are highly repetitive, further contributing to discomfort and, possibly, to risk of injury. Breaks from computer work are most effective in reducing discomfort when short breaks are taken frequently. They are more effective than working for long periods of time and taking longer breaks. Scheduling five minutes of non-computer work per hour provides relief from many of the postural and visual demands. In addition, for computer intensive tasks, attempts should be made to design jobs to include other duties. [vi]. There is a related Ontario Ministry of Labour Health and Safety Guideline on rest breaks.
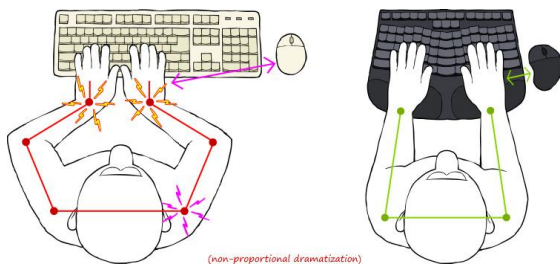
VII. Exercise for Computer Workers- In order to get released from the various visual and muscular fatigue different exercises guidelines are given to the continuous workers-

The exercise for the computer worker is all about stop-stretch and check. [vii] The following are the exercise points to prevent the muscular and visual discomforts-

i) Stop if you feel discomfort when performing an action. Discuss with your treating doctor.

ii) Do a few of these exercises a few times every day.

iii) Make sure you relax and perform them gently.

iv) Hold the stretch or repeat as indicated on the diagram.

v) Do not over-stretch.

vi) Remember to do each side

Fig. 5 Exercises of computer worker.

IX Conclusions- Though various researches had been carried out in this field but this paper is unique in the sense it not only brings out the proper ergonomic design of computer workstation but also proper exercises of different postures of human body to get relieved from pain and stress.

One of the prime problem faced in the designing of the computer workstation and its accessories is that anthropometric details vary from person to person. In an average various heights are suitable for the working of different heights of person therefore design of workstation is done considering the average data. [viii]

The advent of the new technology of VDT is been proven quite useful in this case as they are providing light weight, flat screen adjustable monitors.

The advent of new flat screen VDT technology offers new opportunities to provide improved ergonomics in office and specialty computer workstation environments. The smaller size and lighter weight of these devices has fostered the development of new mounting solutions that can more easily address the age-old problems of screen height adjustability, screen distance and screen adjustments. [ix]. Now VDT and other manufacturers can provide low-cost, vertically adjustable desk stands and easy monitor tilt capability, to address the average range of operators in either sitting or standing applications. In addition, specialty devices are available to provide reasonable cost solutions to address special ergonomic issues such as providing screen distance adjustability, comfortable viewing for bifocal users, sit-stand applications and providing vertical adjustability for the 5% female – 95% male range of operators.
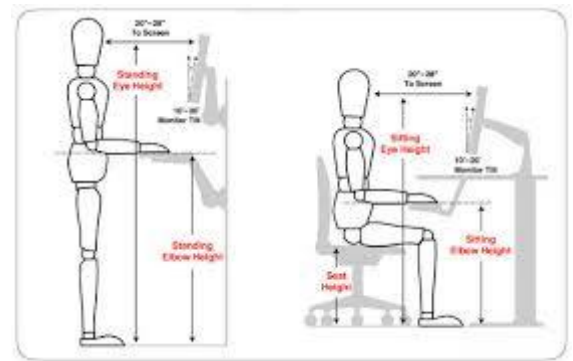

Fig. 6 Adjustable VDT's

To avoid the glare problem light control methods are used with vertical, horizontal or roller thick curtains which can be adjusted according to the requirements.

In a concluded form an ergonomic design of computer workstation is only possible after collection of all anthropometric data of persons working there and taking and average data of them with proper adjustment of climatic conditions and resources. The extended work with the computers have created many health related issues such as fatigue in arm, neck and the backbone of the human body. [x] .If computer is used for a longer duration than the risk of musculoskeletal injury increases along with the increased time usage of the system. The basic reason behind this kind of injury is the awkward position of the human body due to the improper design of the computer workstation layout. The muscular as well as physical both kind of discomfort is felt by the computer users. In order to avoid this problem time to time physical exercises should be introduce by the organization.

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