Review Article

COMMON MUSCULOSKELETAL DISORDERS AMONG COMPUTER USERS AND MODIFICATION OF WORK LAYOUT

-A systematic Review

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INTRODUCTION

Invention of computer is one of the greatest achievements of human being. A computer is a device which aids humans in performing various kinds of computations and calculations. The earliest computer was used to perform basic arithmetic operations where as the modern electronic computers are more advanced which can perform a greater number of calculations and computations with in a shorter period of time.

In the 17th and 18th centuries the usage of computers is very limited but in the early nineties the number of people using computers increased. People in all fields started using computers. Twenty years ago if we see office work involves manual calculations, documentation in records and then typing and saving in files. The introduction of computers have decreased the burden of moving from place to place in order to gather information as a result working become easy but stationary.

This nature of stationary work where a person constantly work for several hours in front of a computer lead to a great impact on their health. They started to develop various kinds of health related problems mainly involving the musculoskeletal system especially upper limbs and neck.

Workstation layout can be source of musculoskeletal disorders. Adaptation of prolonged static poor posture may lead to low level of muscle activation which may turn into chronic pain after a prolonged period of time[---15]. These observations are well documented for trapezius which could explain the pain in the neck and shoulder region in association with computer work.

There are several researches done on preventing musculoskeletal disorders while using computers but still the prevalence of problems is persisting.

The studies done by Fisher et al 1993, Sundelin and Hagberg in 1989 recommends adaptation of pauses during work to avoid discomfort, which is quite difficult to implement at work due to time constraints. Another proposed means is to favor support for upper limb during work this support can be given at wrist, forearm, and elbow[8,15].

Research done by Aaras et al 1997, Fernstrom and Fricson 1997, Lintula et al 2001, visser et al 2000, have proved that the usage of arm rest reduces the electromyographic activity of the trapezius muscle and other upper limb muscles. They also reported beneficial effects for the right and left trapezius for key board work[1,11].

Both ergonomics interventions effectively reduced MSD and improved body posture

The purpose of doing this review is to find out whether modification of work layout is beneficial for decreasing the incidence of musculoskeletal disorders when using computers.

METHODOLOGY

A computer based search was done starting from January 2013 to April 2013 in 3 internet databases CINAHL, MEDLINE and Pub med Citations. The study covered three areas, musculoskeletal disorders, computer users and type of work lay out. At least two key terms between these two words should match. A total of 15 studies which met the inclusive criteria were selected which explains the association between computer usage and musculoskeletal disorders.

Inclusive criteria:

1. The study should be peer reviewed and should be in English
2. Computer users in working area
3. Definite musculoskeletal problems

Exclusive criteria:

1. The study is excluded if computer users are children or normal people other than workers
2. Study excludes subjects with any other neurological problems

Quality assessment

The included articles were assessed with respect to their methodological strength, based on existing quality criteria from a previous review of work-related risk factor for neck pain. The present quality assessment list included the same items as used by Ariens and co-workers, Each of the items were scored either positive (1), negative (0), or not applicable. The number of items that were applied differed slightly between articles depending on the study design. The conclusion on methodological quality was divided into low (below 50% positive scores), moderate (50–65), high (65–80), or very high (above 80%) quality. The authors therefore considered each paper with respect to the result of schematic quality rating, by doing an overall non-systematic evaluating of the studies face validity, as well as their strengths of methodology and analyses.

RESULTS

After taking out the articles from the 1000 titles retrieved through the computerized data base search, approximately about 300 abstracts were evaluated for relevance and were read in full. A total 100 studies were selected out of which 15 studies fulfilled the criteria for inclusion. Ten studies were prospective, effect of an intervention in the work place, and one study had a case-control design, whereas 4 studies had a cross-sectional design.

However, in most of the prospective studies, cross-sectional data analyses are also presented. All studies included in this review were retrieved through the computerized search.

Korhan O. 2012, in his study Computer use and Work Related Musculoskeletal Disorders explained the economic impact of work related musculoskeletal disorders and ergonomic advice and computer key board with different postures. He strongly suggests the use of forearm support when using a key board. This will help in reducing the strain on the trapezius and upper limb musculoskeletal problems.

J.B.carter and E.W. Banister in their review musculoskeletal problems in visual display terminal work discusses the possible causes of musculoskeletal pain in VDT workers and outlines strategies to minimize it. The paper reviews workstation, chair, and keyboard design, and makes recommendations to improve user comfort. Also discussed is worker selection, training, posture, conditioning, and rest breaks. Short term musculoskeletal discomfort is experienced by many VDT operators in the telecommunications industry and chronic disability may result in the long term.

Jennie, Carolyn, Gary, Samuel in their study A field evaluation of monitor placement effects in VDT users in NCR Corporation, Atlanta, GA, USA discussed about the appropriate visual display terminal (VDT) location to decrease the Musculo skeletal disorders. Generally, visual strain is associated with higher placement, and musculoskeletal strain is associated with lower placement. Seeking resolution of the debate, this paper provides a comparison of results from previous lab-based monitor placement studies to recommendations and outcomes from viewing preference and neutral posture studies.

The paper then presents results from a field study that addressed two outstanding issues:

Does monitor placement in a workplace elicit postures and discomfort responses similar to those seen in laboratory settings? Results showed placements in the workplace elicited postures similar to those in lab studies. Additionally, preferred VDT location generally corresponded to the location in which less neck discomfort was reported, though that trend requires further investigation. Overall, there seems to be consistent evidence to support mid-level or somewhat higher placement, as a rule-of-thumb, considering preferred gaze angle and musculoskeletal concerns. However, optimal placement may be lower for some individuals or tasks.

Conlon and co-workers performed a randomised controlled intervention trial with alternative computer mouse and forearm support board in a group of 206 engineers from a large aerospace engineering firm. The subjects were randomized into four groups, receiving either one or both interventions or continuing with the conventional computer workstation. The subjects were assessed each week for musculoskeletal discomfort and those reporting a certain level of discomfort were referred to a physical examination with a protocol assessing for the presence of upper extremity and neck musculoskeletal disorders.

Dainoff and co-workers performed an intervention trial in a group of 28 female data entry operators, including an advanced workstation redesign, ergonomic training and optometric corrections. The subjects were assessed with a physical examination one month and one year post-intervention. The examination consisted among others of measurements of the range of passive movements, tenderness or pain upon provocation and palpation of trigger points in the trapezius. The study was assessed as having a moderate quality with 56% positive items in the schematic assessment.

The authors found a decrease of positive signs and trigger points in the shoulder at the one month test following the intervention.

Min-yong park, jung-yong kim, jong-hyun shin did their study in department of industrial engineering. Hanyang university, south korea. In their study Ergonomic design and evaluation of a new VDT workstation chair with keyboard–mouse support. A new-concept VDT workstation chair with an adjustable keyboard/mouse support was proposed to minimize the physical discomfort and the risk of cumulative trauma disorders (CTDs) at work sites. An experiment was conducted to compare the new workstation chair to a conventional computer chair without a keyboard–mouse support by measuring muscle fatigue and subjective discomfort. Six volunteer subjects participated in six 1-hour word-processing sessions with two different chairs and three different work postures. Statistical results indicated that the new-concept VDT chair generally improved subjective comfort level and reduced fatigue in the finger flexor/extensor and the low back muscles. Implications of the new design and suggestions for further development are addressed.

DISCUSSION

Based on the present review Musculo skeletal disorders at work place in computer users can be prevented by modifying the work station lay-out. According to csjogard and sogaard usage of forearm support can reduce the impact of tension on the trapezius muscle reducing the upper limb disorders. Research done by Aaras et al 1997, Fernstrom and Fricson 1997, Lintula et al 2001, visser et al 2000, have proved that the usage of arm rest reduces the electromyographic activity of the trapezius muscle and other upper limb muscles.

J.B.carter and E.W. Banister in their study supports the good postural control, chair and good key board design can minimize the musculoskeletal disorders in computer users. Conlon and coworkers also supports the usage of forearm support when using computer mouse at workstations. Dainoff MJ, and co workers strongly suggests ergonomic training and advanced redesign of the work station and optometric corrections for minimizing the work related musculoskeletal disorders. Yong and co workers introduced new concept of VDT workstation chair with an adjustable key board and mouse support to minimize musculoskeletal disorders.

The main limitation of the study is the small number of reviews, this call for future research with more number of reviews to find out the type of work station for minimizing Musculo skeletal disorders in computer users.

CONCLUSION

Modification of workstation in terms of height of the monitor, chair with proper back rest, proper forearm support when working with key board or mouse will help in minimizing common Musculo skeletal disorders among computer users.

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