Evaluate the effectiveness of educational training program about repetitive strain injury on computer users' employees at Damanhour University

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Abstract:

Background: The application of computer technology is revolutionizing the workplaces nowadays. Extent of computer usage in public and private sectors had been greatly increased in recent decades carrying the risk of several health hazards. **Aim of the study:** To evaluate the effectiveness of educational training program about repetitive strain injury on computer users' employees at Damanhour University. **Subjects & Methods: Research design:** The study was carried out through interventional study design. **Setting:** The study was conducted at the computer workstations of the Main Administrative University Building of Damanhour University. **Subjects:** Computer users' employees from the previously mentioned setting were included in the study; the total sample was 200 employees. **Tools of data collection:** Two tools were used for data collection: 1) A structured interview schedule, 2) Observation checklist. **Results:** The majority of the studied sample did not complaint from body ache preceding being computer users. More than three quarters (83.0%) of them were working on computer from 6 to less than 10 hours daily. Pre-program implementation, only 9.9% of them had correct knowledge about risk-free practices' scored as good practices, this increased to 38.9% post-implementation. The overall of computer users' observed practices were improved post- program implementation. **Conclusion:** The study concluded that post-implementation of the educational program, enhancement on computer users' knowledge, practices, and health status were noticeable. **Recommendations:** The study recommended that computer users should be certified for harmless practices and accomplishing compulsory on work education program.

Key words: Ergonomics; A repetitive strain injury; work environment; occupational health issue

Introduction:

In the past three decades computers have significantly changed the working environment, simplifying and speeding up many tasks across many work areas. However, with these advances have come some potential health issues. [(1)]

The 'information age' has led to more people using computers and longer periods of usage than in the past. According to the US Census Bureau, approximately 50% of all employed adults in the US used computers and keyboards at work at 1997. Ergonomics is the appraisal of the association between work and the employee can be used to make work fit worker's body instead of the other way around. A range of physical conditions may develop or be made worse by working with computers. [(1, 2)]

Repetitive strain injuries (RSI) can be defined as injuries caused or aggravated by repetitive or sustained submaximal exertion of the body's soft tissue structures including muscles, tendons, ligaments, and nerves. [(2)] Not only are these injuries associated with personal morbidity and direct costs to the health care system, but considerable loss of productivity and disability claims are associated with substantial indirect costs to society. It is not a condition that is age specific affecting young people who are considered to be in good physical health. [(3, 4)] About 30% of the work force in developed and much more in the developing countries report with work related problems. The percentage of repetitive strain injuries to total injuries as reported by Occupational Safety and Health Administration has increased by 34% in twenty years. [(5, 6)]

Repetitive strain injuries can cause a variety of symptoms, and early symptoms can be hard to notice, so many computer users may not realize that problems are underway.[(7)]

Musculoskeletal symptoms and disorders are a common finding among computer users, many people experience upper limb, neck or back discomfort and pain. However, the onset of symptoms and the movements or body postures adopted while working at computers are often related. Symptoms may include: pain; fatigue; muscle discomfort; stiffness; burning sensations; weakness; numbness; tingling. [8, 9]

Repetitive Strain Injury disorders are usually known as numerous dynamics problems where the work surroundings and the running of work contribute meaningfully.[10] According to Ariens et al. [11] risk factors were subdivided as follows: individual factors (gender, age), physical factors (working posture, job activity, workstation set-up and design) and psychosocial factors.

Strategies for the prevention of computer-related disorders must be based on redesigning the work and systems so that factors identified as causing health problems can be eliminated. [12] Attention to the physical work environment should be a central focus for the prevention of computer-related disorders. Ergonomic principles for computer users should focus on adoption of more appropriate work postures and behaviors, safe work practices, problem-solving skills, promotion of self-responsibility, and enhanced worker based participation in decision-making. [13, 14]

Computer users need to know how to create good ergonomic working arrangements for computer workstations, including placement of the screen, keyboard, mouse and lighting. Furthermore, they need to be aware of the importance of short breaks to decrease the stress in soft tissues; discs and nerves caused by the static postures and prolonged sitting frequently involved in computer use. [15]

Significance of the study:

Work related musculoskeletal disorders have been described as the most notorious and common causes of sever long term pain and physical disability that affect hundreds of millions people across the world. If we ignore them and they are not treated in time, they can cause a great deal of suffering, as well as a decrease in productivity and an increase in compensation and health care costs.[16] The study done At 2008 showed that 68% of UK workers suffered from some sort of RSI, with the most common problem areas being the back, shoulders, wrists, and hands. According to the World Development Report a higher prevalence of computer use in Egypt was estimated about 20 percent. An apparent lack of epidemiological research locally highlights the need for further investigation. [7]

Aim of the study:

the aim of the current study was to evaluate the effectiveness of educational training program about repetitive strain injury on computer users' employees at Damanhour University.

Research Hypothesis:

There is a positive effect of the educational training program about repetitive strain injury on computer users' employees at Damanhour University.

Subjects and Methods:

Research design:

An interventional study design was used.

Study setting:

The study was carried out at computer workstations of the Main Administrative University Building affiliated to Damanhour University.

Study subjects:

Computer users' employees working at the Main Administrative University Building of Damanhour University were included in the study.

Sample technique:

By using convenient sample technique all accessible employees at the time of the study were included. Numbers of working employees in the computer workstations of the Main Administrative Building was 200, which is the highest setting in computer use

rate (15.2%) of all university settings. All computer users at the studied setting were fulfilled the inclusion criteria based on the National Institute of Environmental Health Sciences' criteria. [17]

Sample size:

Sample size was calculated at significant level 95% and power 80% to detect an effect size of 0.27 regarding neck pain improvement and assuming prevalence of neck pain (52.4%) and alpha error (0.05).

Tools of data collection:

Two tools were applied.

Tool (I): Designed Interview Schedule: It composed of three sections:

Section (1): Personal and social data as age, sex, level of education, income. Health history and co-morbidity: presence of medical disease (hypertension, diabetes, osteoarthritis), complains of body ache. Occupational history and performing workouts.

Section (2): Assessment of health complaints: Modified Physical Health Questionnaire [18] was used to assess musculoskeletal problems as cold hands while entering data, difficulty in turning the pages of a book, difficulty in turning door knobs or taps, waking during the night with numbness or pain in hands, pain in the hands, fingers, thumbs or wrist, elbow, arm, shoulder, upper and lower back problems or pain, neck tension, shooting pains in the jaws and into ears, swollen ankles, foot or toes pain, down legs pain and grinding teeth.

Section (3): Assessment of computer users' knowledge: Computer users' knowledge about repetitive strain injury in relation to the use of computer and safe computing practices as definition, risk factors, symptoms, ergonomic principles and prevention of computer-related disorders.

Tool (II) Observation checklist:

Section (1): to assess practices of computer user.

Section (2): to assess the computer workplace design.

Scoring system:

For assessing health complaints: computer employers specified exactly how frequently they had endured from a range of 18 somatic conditions in the preceding month. A score of (0) was given for rarely, a score of (1) for sometimes and a score (2) for often complained. The overall score was (0-36). Health complaints score was calculated as follows: Severe 100-75% = 36 - 27 points, moderate <75%-50% = <27 - 18 points and mild <50% = < 18 - zero points.

For assessing knowledge about repetitive strain injury and risk-free computing practices**:** the questionnaire consists of 10 items. A score of (2) was given to the correct complete answer, a score of (1) for correct incomplete answer and a score of (0) for the wrong or missed answers. The total score was (0-20).Knowledge score was calculated as follows: good 100- 75% = 20- 15 points, fair <75%-50% = < 15- 10 points and poor <50% = <10 - zero points

For assessing practices: the questionnaire includes 10 items. A score "1" was given to accurately done while, score "0" was given to inaccurate or not done. The total score was (0-10).The observed practices score was calculated as follows: good 100- 75% = 10 - 7.5 points', satisfactory <75%- 50% = < 7.5 - 5 points and poor <50% = <5 - zero points**.**

For measuring workplace design adjustment: the observational checklist includes 18 items. A score "1" was given to well adjusted. While, score "0" was given to poorly adjusted item. The total score was (0-18).The observational workplace modification score was calculated as follows: good 100- 75% = 18 - 13.5 points, satisfactory <75%- 50% = <13.5 - 9 points and poor <50% = <9 - zero points

Validity and reliability:

Tools were developed by the researchers after thorough reviewing of recent literature and judged by three jury experts in the field of community

health Nursing, Damanhour University and High Institute of Public Health at Alexandria University to assess content validity. Cronbach's Alpha was used to test the tool reliability (= 0.705 for health complaints, = 0.771 for practices and = 0.778 for workstation adjustment).

Field work:

Data was collected from January 2013 to March. The interview questionnaire was conducted with computer users' employees in their work place by using tool I and II at pre-intervention phase. Based on results and literature review educational training program on the repetitive strain injury was established.

Re-evaluation was performed 6 months post- program implementation by tool I (section 2 & 3) and tool II (section 1 & 2). (Post-test). Each interview and observation took 45-60 minutes. Participants' observation done in average of two work process.

Finally, they were assessed to evaluate the effectiveness of the educational training program about repetitive strain injury on computer users' employees at Damanhour University.

first phase: Preparation and organization of training program's sessions: Preparation of sessions: Educational training program 's sessions were prepared by the researcher for the computer users ' employees. The content of the sessions was based on review of literature, sample features and results of assessment. The aims of the sessions are to: Help computer users' employees to prevent of repetitive strain injury.

Educational training program strategies: Educational program methods: Different methods of instructions were adopted as brain storming, group discussion, case study and role play. Teaching aids: Different aids were used to facilitate and illustrate teaching such as posters, handouts and videos.

Implementation of sessions: This phase included the implementation of the planned educational program. The studied sample (200 computer user) was divided into small groups (20 groups, 10 computer users/group). Therefore, educational program were implemented through three sessions for each group (3 sessions /week). Each session lasted approximately 45 minutes. Firstly, discussion of the session objectives and content were dedicated. Then, time was available for computer user's participation and interaction. Different methods of instructions and teaching aids mentioned before were used. Total duration for program implementation was five months (June till October 2013).

Evaluation phase: Reassessment was done after six months of the completion of the program (May-July 2014). The computer users' employees were assessed to determine the effectiveness of the training program about repetitive strain injury on them.

Pilot study:

A pilot study was conducted on 10 computer users out of the sample, who were selected randomly from Faculty of Nursing and Faculty of Commerce, Damanhour University. Some modifications were performed related to questions about Computer users' knowledge about repetitive strain injury in relation to the use of computer and safe computing practices.

Administrative and ethical considerations:

For execution of the study, a written official letter was obtained from the Faculty of Nursing, Damanhour University and directed to University Administration to collect the necessary data. Verbal approval was attained from computer users after clarification of the purpose of the review.

Statistical analysis:

Using Statistical Package for Social Sciences (SPSS) version 16.0 for data analysis and at level of significance <0.05.

The following statistical measures were used: Count and percentage: used for describing and summarizing

qualitative data. Mean (X), standard deviations (SD) were used as measures of control tendency and dispersion respectively for normally distributed quantitative data. McNemar test (matched analysis): applied to assess significance between two correlated proportions (pre- and post-program). Graphical presentation included bar graph.

Results:

Table (1): Illustrates that closely half of the studied subjects (49.0%) their age fluctuated from 20 to less than 30 years, and their mean age was 28.5 ± 5.9 yrs. Females represented more than one fifth (24.5%) of computer workers, and the rest three forth (75.5%) were males. Concerning the educational level, it was observed that 70.0% of them had Bachelor & post graduate education.

Table (2): Shows that 78.0% of computer employees didn't suffer from health condition at all. Those who had history of medical disease, 54.6% mentioned that they have hypertension and 16.0% stated that they have rheumatic arthritis. Furthermore, 83.5% of the studied sample didn't suffer from body ache before being computer users and only (16.5%) of them complained from pain before being computer user. As regards to the site of pain, more than half of computer users (81.8%) had upper backache. While, 51.5% had neck pain and more than one third (39.4%) reported arm pain and few percent (9.1%) had legs pain.

Table (3): shows that the average time of applying computer was 7.19 ± 0.531 yrs. The majority (83.0%) of the sample were working on computer on a daily basis from six to less than ten hours.

Table (4): Portrays that one fourth (25.0%) of computer users' employees were experiencing moderate upper musculoskeletal problems at pre-program implementation compared to few percent (2.5%) post- program. Considerable change was noticed between studied sample pre and post-program implementation related to upper musculoskeletal problems' score (X^2_{mc} = 16.15, P=0.013). On the other hand, 12.5% of computer users at pre-program implementation were experiencing serious lower musculoskeletal problems, only 2.5% of them post- program. Additionally, the majority of them were suffering from mild lower musculoskeletal problems at post- program implementation, competed to 65.0% of them at pre-program. There was a major change related to lower musculoskeletal problems' score (X^2_{mc} = 23.92, P= 0.000).

Figure (1): Shows that 66.5% of the employees didn't know previously about risk-free practices matched to 33.5% had.

Table (5): Portrays the effect of educational training program about repetitive strain injury on computer users' total knowledge scores. It was observed that the mean knowledge scores of studied sample were significantly higher at post-program implementation (76.58 ± 6.65) than that of the pre- program implementation (55.16 ± 14.03), (X^2_{mc} =5.6, p=0.000).

Table (6): Portrays that 54.5% of the studied sample at pre-program mentioned that they were taking rest breaks while working at computer; this increased to 84.0% post-program implementation. Moreover, 30.3% of them were taking rest breaks every one hour at pre-program implementation, this percentage increased to 46.4%. Minority of studied sample were performing exercises earlier compared to 76.0% later. Moreover, it was noticed that 88.2%, 47.1%, 47.1% and 29.4% of the sample were practicing neck, shoulder, arms and back exercises respectively at pre-program; this increased to (94.1%, 59.9%, 82.2% and 49.3% respectively) at post-program implementation. There was significant difference between computer users' practices at pre and post- program implementation regarding sites of exercises (X^2_{mc} =

297.34, P= 0.000).

Table (7): Describes the overall practices of observed computer users were improved at post-program implementation. Where, less than two thirds (65.0%) of observed computer users sitting at arm length from monitor at pre-implementation phase; this percentage increased to 97.0% at post-program implementation.

Moreover, nearly equal percent (62.5%, 59.5%, and 58.5%) of the sample moving frequently for circulation, sitting at upright position, and monitor and keyboard at midpoint of them, at pre-program implementation; this percentage increased to 81.0%, 94.0%, 96.5% at post- implementation respectively. Also, 32.5% of the observed computer users' forearms are parallel with the floor or angled slightly downward at pre-program implementation, their practices increased to 55.5% at post-program implementation. Only 5.0% of computer users using a document holder at pre-implementation phase; this was slightly increased to 13.0% at post-program implementation.

Important changes were found between pre and post-program implementation regarding computer users' observed practices which includes sitting at arm length from monitor, moving frequently for circulation, sitting at upright position, center monitor, wrists are flat and straight in relation to the forearms and arms and elbows are relaxed close to body (X^2_{mc} = 80.04, 125.14, 64.95, 48.75, 112.46 and 79.66 respectively).

Figure (2): Reveals that the total practices of the studied sample were scored as good practices by 8.0% at pre-program implementation and improved to be 36.1% at post-program implementation. Additionally, the majority (75.3%) of them had poor practices' score at pre-program implementation; this reduced to less than half (46.0%) at post- program implementation.

Figure (3): Portrays that at pre-program implementation, only 9.9% of those computer users had correct knowledge about risk-free computing practices scored as good practices, this increased to 38.9% at post-implementation. Likewise, less than one quarter (23.8%) scored as fair practices at pre- the program, this decreased to one fifth (20%) at post-program implementation. Additionally, at pre-program implementation, nearly two thirds (66.3%) of the sample had poor practices scores, these percentages diminished later (41%).

Table (8): Represents that the overall observed computer workplace design were improved at post-program implementation. More than one tenth (14.5%) of observed computer users can adjust the backrest height to fit their back at pre- program implementation; this percentage increased to 20.0% at post-program implementation. More than one forth (27.5%) of observed computer users can easily adjusted their chair at pre-program implementation compared to 45.0% at post- program implementation. At pre-program implementation 6.5% of the observed sample was provided with footrest compared to 10.0% at post-program implementation. In addition, 5.0% of observed sample were provided with document holder at pre-implementation phase; these percentages were slightly increased to (8.5%) at post-program implementation. It was observed that more than half (54.5%) of computer users had no glare on monitor screen and less than one third (31.5%) of them adjusting the top of monitor screen at about 2-3 cm above eye level at pre- program compared to 57.0% and 51.5% of them respectively at post-program implementation. With respect to workplace layout, it was observed that more than one fifth (21.5%) of the sample can reach easily to all often-used items at pre-program compared to 41.5% at post-program implementation. Additionally, at pre-program implementation more than half (58.5%) of the sample had noise level conducive to concentration and increased at post- program

implementation to (63.0%). Statistically significant differences were found between the computer users' observed workplace design at pre and post-program implementation regarding particular items which includes easily adjusted from a seated position, seat height is adjusted, backrest height is adjusted, document holder is in-line with the computer screen, documents can be manipulated easily as required, monitor is adjusted at about 2-3 cm above eye level, no glare on screen, all often-used items are within easy reach, satisfactory lighting, adjust lighting to avoid glare on screen and avoiding intense lighting in the field of vision (X^2_{mc} = 112.27, 171.11, 119.17, 195.37, 184.10, 99.52, 164.70, 92.93, 166.97, 124.80 and 176.04 respectively).

Figure (4): Illustrates that 33.0% of the sample had good scores of workplace design at pre-program implementation. This was enhanced to exactly half percent at post- program implementation.

Discussion:

Digital technologies have become a central feature of the 21st century and will become an even more fundamental and critical part of how we live. A quick expansion in usage of highly developed technology uplifted concern for the health and well-being of the computer users. It is identified that computer may affect the users' health and lead to repetitive strain injury (RSI) and psychosocial stress. [19, 20]

Numerous studies reported that there is need for carrying out intervention programs that consist of the concepts of ergonomics, health education, and training of computer workers so as to be able to inhibit the occurrence of repetitive strain injury (RSI). [21-23] Therefore, this study was conducted to evaluate the effectiveness of educational training program about repetitive strain injury on computer users' employees at Damanhour University.

The present study revealed coexistence of more than one form of discomfort among computer users. In the study three quarters of the studied population suffered from mild upper musculoskeletal discomfort and nearly two thirds of them experienced mild lower discomfort namely, neck pain, shoulder pain, arm pain and backache. These results are in agreement with other studies that reported a high prevalence of musculoskeletal discomfort among computer users. [24] This discomfort may be due to poor ergonomic environment that may lead to unsafe computing practices, unhealthy posture, fixed position for prolonged period and lacking for practicing physical exercise to improve circulation. [25]

The length of daily working hours is considered as a risk factor for the development of musculoskeletal complaints among computer users. [26] The more the hours users spent in front of a computer screen the higher the incidence of computer syndrome. The present study indicated that the mean daily working hour's users spent in front of the computer was 8.5 hours, which considered an extensive period. This may attributed to the nature of work at the Main Administrative University Building. This result was similar to Al-Wehedy et al.[24] and Jensen [27] who found that the duration of computer use predicate a high prevalence of musculoskeletal disorders.

Exposure to risk factors such as time spent at the computer without breaks, and unsuitable workplace design were attributing to the existence of repetitive strain injury (RSI).[13] The idea of taking stretch breaks, appeared when people recognized that best ergonomic arrangement was insufficient to prevent work interrelated musculo-skeletal disorders (WRMSDs). [28, 29] Uncomfortable position and long sitting are all indicators for getting musculo-skeletal problems. [30, 31] The present study indicated that more than half of computer users' taking breaks every two hours which consider long

duration to sit on fixed position, furthermore the majority of them not practicing exercises and a major increase of those taking break apparent at post- program implementation. These results were in accord with Menzel [32] and Thorn et al. [33] Regular stretch break ranged from 30 or 60 second every half hour is needed to improve blood circulation and decrease the level of discomfort that is associated with sitting in one position. [27] So, it is recommended that individual should have recovery time ranged from 10 to 15 minutes each hour during computer work. [34]

Great reviews regarding the efficiency of exercises in reduction the risk of emerging repetitive Strain Injury (RSI) where a clear advantage of exercises is well-known. Stretching exercises can benefit in decreasing muscle tension. [34] The current study verified that there is rise in the proportion of those practiced exercises at post- program implementation. These results were in compliance with Sjogren [35] reported that the frequency, duration and intensity of the training and guidance observed in the workplace, seems to be adequate to alleviate musculoskeletal symptoms.

The optimistic effect of the educational program on understanding and practices were anticipated from texts and study's results. [21] Concerning knowledge of computer users about repetitive strain injury and risk-free computing practices, the current study shown that, more than two thirds of the sample had poor knowledge scores at pre-program implementation. This result was in line with Cooper et al [36] and Hakala et al [17] studies as they stated that the lesser of computer workers had information about risk-free computing work practices. This may be attributed to lack of work in-service training programs for university computer users' employees about safe computing practices. But, computer users' knowledge in current review had shown that their knowledge upgraded at post-program implementation. This may results because the influence of program on the computer users' knowledge.

The educational training program has an important consequence on enhancing the score of computer users' practices. This is in the same line with Ekiof et al [37] and Amick et al [38] as they demonstrated that ergonomic training had a statistically important outcome on computer users' practices. This may be caused by important information acquired from the ergonomics program, computer users were successfully able to pass on training knowledge to correctly modification and adjustment their workplace to implement risk-free computing behaviors and improve their practice.

Physical workplace design, job demands, way of keyboard action, place of computer screens, and type and usage of input devices are connected to work interrelated musculoskeletal disorders (WRMDs).[13] There is evident that repetitive strain injury (RSI) can be decreased through an ergonomics approach and via education, so employers should also continue to offer employees who use computers with proper ergonomics teaching.[28] Suitable ergonomic design and adjustment of the computer and the work environment can increase productivity and worker comfort. Observational assessment of the studied computer workplace and computer users' practices, described the ergonomic changes which have been done by the studied computer users in their workplace at pre and post-program implementation. There were significant changes related to posture, chair, document holder monitor, layout and environment at pre and post-program implementation which is in accordance with the results of Smith et al. [29] This may attributed to the educational level of computer users which affect their acceptance for the training program. Problems associated with computer workplace are generally temporary and can often

be solved using simple corrective measures. Adjustment of the workplace to meet the individual needs of the operator is also important for overall performance and comfort. (23)

When evaluate the effectiveness of the repetitive strain injuries' education program on computer users' health complaints, important enhancement of users' musculoskeletal problems were noticed subsequently to program implementation. These findings were reinforced by Mongini et al. (39) and Shumay.(40)

Currently corporations, education institutions and private individuals spend billions of dollars on hardware, software and how to operate both. Yet, little or nothing is spent on 'body ware,' which is the skill necessary to use oneself correctly and efficiently at the computer while maintaining health.(40) So, it is necessary that the existing current information on how to lessen RSI needs to be provided to every person when they first begin using a computer, be that at school, home or the worksite.

Conclusion:

At pre-program implementation around two thirds of the computer users had poor practices scores related to correct knowledge about risk-free computing practices and they were suffering from several health complaints. At post-implementation of the educational program, advanced enhancement on knowledge, practices, workplace design adjustment, and health status of computer users were obvious.

Recommendations:

- Enhance the role of mass media in enlightening community about unsafe practicing of computer.
- Development of programs should be focused on prevention of repetitive strain injury among computer users.
- Computer users should be certified for safe computing practices and accomplishing compulsory on work education program.
- The strategies of prevention of repetitive strain injury should also be disseminated and oriented to all employees.
- Expansion and distribution of guideline for employees about safe computing practices.

Table (1): Distribution of computer users according to their socio-demographic characteristics

Socio- demographic characteristics	No. (n = 200)	%
Age (years):		
▪ 20 -	98	49.0
▪ 30 -	70	35.0
▪ ≥ 40	32	16.0
Means ± SD	28.5 ± 5.9	
Sex:		
▪ Female	49	24.5
▪ Male	151	75.5
Level of education:		
▪ Above average education	60	30.0
▪ Bachelor & post graduate	140	70.0
Income per month:		
▪ Enough & save	2	1.0
▪ Enough	108	54.0
▪ *Not enough*	90	45.0

Table (2): Distribution of computer users according to their medical history

Medical history	No. (n = 200)	%
History of medical disease		
▪ No	156	78.0
▪ Presence of medical disease	44	22.0
Types of medical disease # (n = 44)		
▪ Hypertension	24	54.6
▪ Gout	12	27.3
▪ Diabetes Mellitus	10	22.7
▪ Rheumatic arthritis	7	16.0
Complains of body ache before being computer user:		
▪ Yes	33	16.5
▪ No	167	83.5
Site of pain:# (n = 33)		
▪ Upper backache	27	81.8
▪ Neck	17	51.5
▪ Arms	13	39.4
▪ Legs	3	9.1
Surgical operation in musculoskeletal system		
▪ Yes	5	2.5
▪ *No*	195	97.5

 # Not mutually exclusive

Table (3): Distribution of computer users according to occupation history of using computer

History of using computer	No. (n = 200)	%
Duration of use (years):		
▪ < 1	14	7.0
▪ 1-	68	34.0
▪ 5-	55	27.5
▪ 10-	53	26.5
▪ 15 & more	10	5.0
Means ± SD	7.19 ± 0.531	
Daily use (hours):		
▪ 6 -	166	83.0
▪ 10 and more	34	17.0
Means ± SD	8.5 ± 2.021	

Table (4): Distribution of computer users according to their health complaints scoring pre- and post- program implementation

Items	Pre- program implementation		Post- program implementation		X^2_{mc} (P)
	No. (n = 200)	%	No. (n = 200)	%	
Upper musculoskeletal problems:					
▪ Severe	0	0.0	0	0.0	16.15 P = 0.013*
▪ Moderate	50	25.0	5	2.5	
▪ Mild	150	75.0	195	97.5	
Lower musculoskeletal problems:					
▪ Severe	25	12.5	5	2.5	23.92 P= 0.000*
▪ Moderate	45	22.5	10	5.0	
▪ *Mild*	130	65.0	185	92.5	

X^2_{mc}: Mc-Nemar test for related groups ** Statistically significant at p ≤ 0.05*

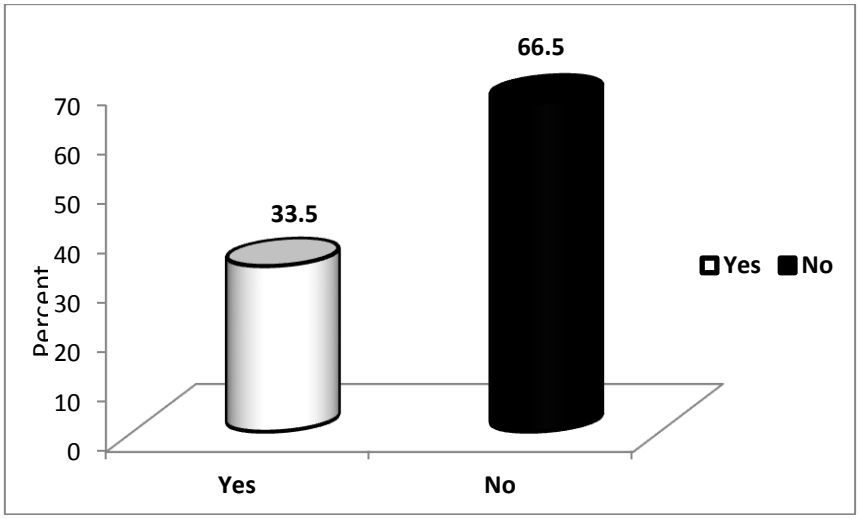

Figure (1): Computer users' previous knowledge about risk-free computing practices

Table (5): Effect of educational training program about repetitive strain injury on computer users' total knowledge scores

Total knowledge scores	Pre- program implementation n=200		Post- program implementation n=200	
	No	%	No	%
Knowledge				
Poor knowledge (<50 %)	133	66.5	29	14.5
Fair (50 - <75%)	46	23.0	100	50.0
Good (≥75%)	21	10.5	71	35.5
X^2_{mc} (P)	5.6 (0.000)*			
Mean ± SD	55.16 ± 14.03		76.58 ± 6.65	

X^2_{mc}: Mc-Nemar test for related groups ** Statistically significant at p ≤ 0.05*

Table (6): Effect of educational training program on computer users' practices of exercise and taking breaks

Practices	Pre- program implementation (n = 200)		Post- program implementation (n = 200)		X^2_{mc}(P)
	No.	%	No.	%	
Taking breaks					
▪ Yes	109	54.5	168	84.0	5.55 P = 0.018*
▪ No	91	45.5	32	16.0	
Frequency:	(n = 109)		(n = 168)		
▪ ½ hour	11	10.1	13	7.7	431.70 P = 0.080
▪ One hour	33	30.3	78	46.4	
▪ 1½ hour	12	11.0	39	23.2	
▪ 2 hours & more	53	48.6	38	22.6	
Practicing exercises					
▪ Yes	17	8.5	152	76.0	8.526 P = 0.004*
▪ No	183	91.5	48	24.0	
Sites of exercise: #	(n = 17)		(n = 152)		
▪ Neck	15	88.	143	94.1	297.34 P = 0.000*
▪ Shoulder	8	47.1	91	59.9	
▪ Arms	8	47.1	125	82.2	
▪ Back	5	29.4	75	49.3	
▪ Eyes	0	0.0	22	14.5	

 # Not mutually exclusive *X^2_{mc}: Mc-Nemar test for related groups* **statistically significant at p ≤ 0.05*

Table (7): Effect of educational training program on computer users' computing practices

Computing practices	Pre- program implementation (n= 200)		Post- program implementation (n= 200)		X^2_{mc}(P)
	No	%	No	%	
▪ Sitting at arm length from monitor.	130	65.0	194	97.0	80.04 (P= 0.000)*
▪ Moving frequently for circulation.	125	62.5	162	81.0	125.14 (P=0.000)*
▪ Sitting at upright position (back straight).	119	59.5	188	94.0	64.95 (P= 0.000)*
▪ Monitor and keyboard at midpoint of him.	117	58.5	193	96.5	48.75 (P= 0.000)*
▪ Relaxing feet on a stable foot rest.	70	35.0	70	35.0	77.82 (P= 0.100)
▪ The user's forearms are parallel with the floor or angled slightly downward	65	32.5	111	55.5	105.13 (P= 0.060)
▪ Wrists are flat and straight in relation to the forearms to use keyboard/ mouse/ input device.	62	31.0	114	57.0	112.46 (P= 0.000)*
▪ Thighs are parallel to the floors and knees at about the same level as the hips.	58	29.0	65	32.5	62.97 (P= 0.080)
▪ Arms and elbows relaxed close to body.	50	25.0	119	59.5	79.66 (P= 0.000)*
▪ Using a document holder.	10	5.0	26	13.0	60.08 (P= 0.100)

X^2_{mc}: Mc-Nemar test for related groups ** statistically significant at p ≤ 0.05*

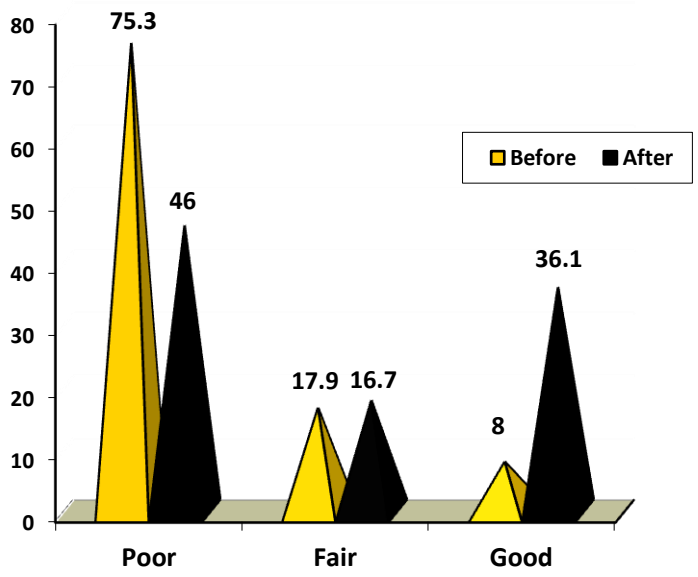

Figure (2): Computer users' total observational practices scores at pre and post- program implementation

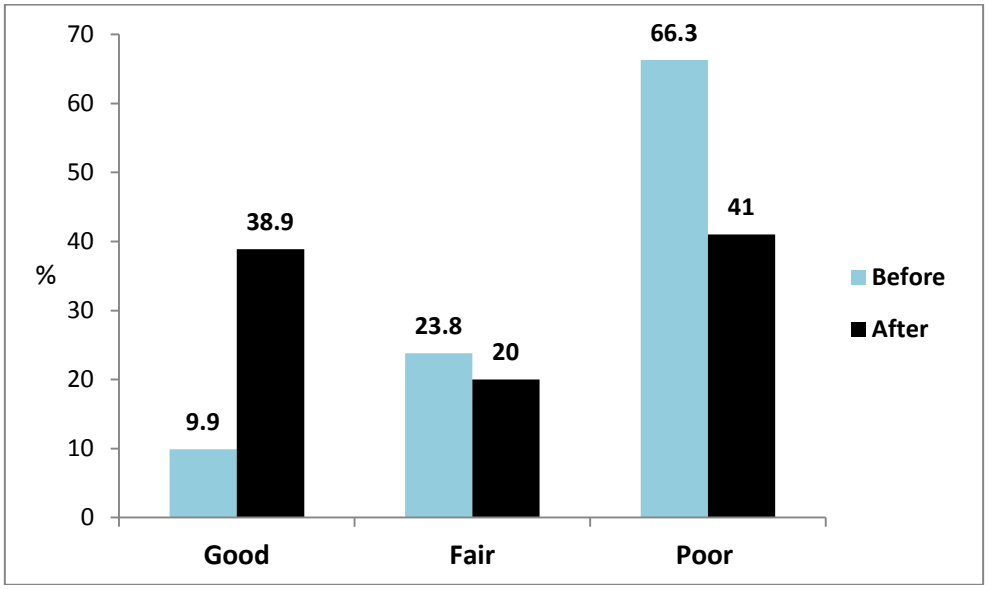

Figure (3): Relation between computer users' correct knowledge and observational practices' scores at pre and post- program implementation

Table (8): Effect of educational training program on computer users' workplace design

Workplace design	Pre- program implementation (n= 200)		Post- program implementation (n= 200)		X^2_{mc}(P)
	No	%	No	%	
Chair:					
▪ Easily adjusted from a seated position	55	27.5	90	45.0	112.27 P = 0.000*
▪ The seat height is adjusted	25	12.5	69	34.3	171.11 P = 0.000*
▪ The backrest height is adjusted	29	14.5	40	20.0	119.17 P = 0.000*
▪ The user can get close to the workstation without impediment	91	45.5	114	57.0	63.43 P = 0.200
Foot rest:					
▪ The user provided with a footrest	13	6.5	20	10.0	65.87 P = 0.240
Document holder:					
▪ A document holder is provided	10	5.0	17	8.5	98.99 P = 0.063
▪ The document holder is in-line with the computer screen	1	0.5	13	6.5	195.37 P = 0.000*
▪ Documents can be manipulated easily as required	5	2.5	12	6.0	184.10 P = 0.000*
Monitor:					
▪ Monitor is adjusted at about 2-3 cm above eye level	63	31.5	103	51.5	99.52 P = 0.000*
▪ No glare on screen.	109	54.5	114	57.0	164.70 P = 0.000*
Layout:					
▪ All often-used items are within easy reach.	43	21.5	83	41.5	92.93 P = 0.000*
▪ The workstation is designed to prevent undue twisting of the neck or trunk	19	9.5	21	10.5	85.93 P = 0.082
Environment:					
▪ Satisfactory lighting.	109	54.5	123	61.5	166.97 P = 0.000*
▪ Adjust lighting to avoid glare on screen.	89	44.5	92	46.0	124.80 P = 0.000*
▪ Avoiding intense lighting in the field of vision.	73	36.5	85	42.5	176.04 P = 0.000*
▪ The temperature and airflow in the room are comfortable.	81	40.5	83	41.5	85.75 P = 0.701
▪ *The noise level conducive to concentration*	117	58.5	126	63.0	63.54 P = 0.084

X^2_{mc}: Mc-Nemar test for related groups **statistically significant at p ≤ 0.05*

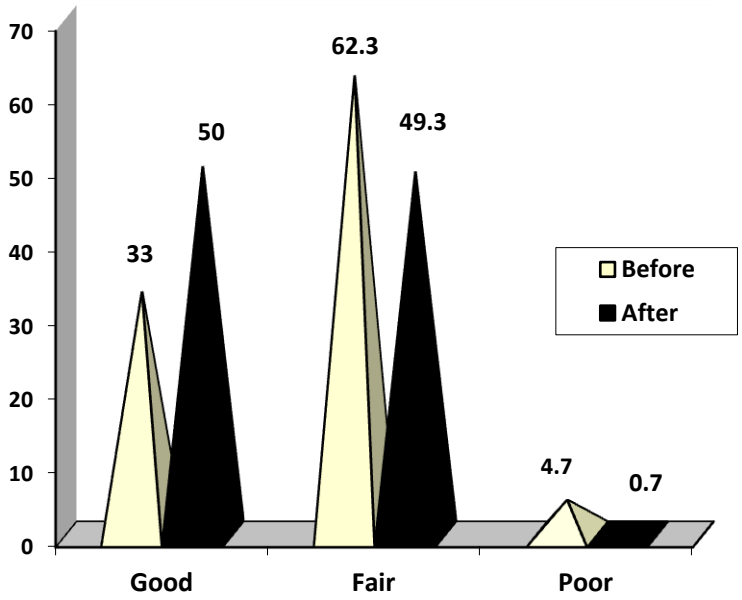

Figure (4): Computer users' workstation design adjustment score pre- and post- program implementation

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تقييم فعالية برنامج التدريب التعليمي حول إصابات الإجهاد المتكررة على الموظفين مستخدمي الكمبيوترفي جامعة دمنهور

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مقدمة:
في العقود الثلاثة الماضية قد غيرت أجهزة الكمبيوتر بشكل كبير بيئة العمل، و تم تبسيط وتسريع الكثير من المهام في العديد من مجالات العمل. ومع هذه التطورات قد تأتي بعض القضايا الصحية المحتملة. العديد من الحالات المرضية قد تحدث أو أن تزداد سوءا بالعمل مع أجهزة الكمبيوتر.
إصابات الإجهاد المتكررة يمكن أن تسبب مجموعة متنوعة من الأعراض، والبعض من هذه الأعراض المبكرة يمكن أن يكون من الصعب ملاحظتها، والعديد من مستخدمي الكمبيوتر قد لا يدركون أن المشاكل بدأت بحدوث هذه الاعراض. أعراض أمراض العضلات والعظام شائعة بين مستخدمي الكمبيوتر، وكثير من الناس لديهم الاجهاد المتكرر بأطرافهم العليا وشعور بعدم الراحة أو الألم في الرقبة أو الظهر.
تستند استراتيجيات الوقاية من الاضطرابات المتصلة بالكمبيوتر إلى إعادة تصميم بيئة العمل والنظم حيث يمكن الحد من العوامل المحددة التى قد تسبب المشاكل الصحية. مستخدمي الكمبيوتر بحاجة إلى معرفة كيفية إنشاء ترتيبات العمل المريحة و الجيدة لمحطات العمل بالكمبيوتر، بما في ذلك وضع الشاشة، لوحة المفاتيح، والماوس والإضاءة. وعلاوة على ذلك، فإنها تحتاج إلى أن تكون على علم بأهمية فترات راحة قصيرة لتقليل الإجهاد في الأنسجة الرخوة.

الهدف من الدراسة:
هدفت الدراسة الحالية إلى تقييم فعالية البرنامج التدريبى التعليمي حول إصابات الإجهاد المتكررة على الموظفين مستخدمي الكمبيوتر في جامعة دمنهور.

التصميم البحثى:
تم استخدام تصميم الدراسة التداخلية لإجراء الدراسة الحالية.

مكان الدراسة:
أجريت الدراسة الحالية بمكاتب الموظفين مستخدمي الكمبيوتر بالمبنى الإداري الرئيسي لجامعة دمنهور. .

عينة الدراسة:
باستخدام تقنية الملائمة فقد اشملت العينة على جميع الموظفين من مستخدمي الكمبيوتر المتاح الوصول إليهم في وقت الدراسة. أعداد الموظفين الذين يعملون بالكمبيوتر بالمبنى الإداري الرئيسي هو ٢٠٠، وهو أعلى الإعداد في معدل استخدام الحاسوب (١٥.٢٪) بالجامعة. و اشتملت العينة على ٢٠٠ من مستخدمي الكمبيوتر من العاملين بالمبنى الإداري الرئيسي لجامعة دمنهور لتقييم فعالية البرنامج التدريبى التعليمي حول إصابات الإجهاد المتكررة على الموظفين مستخدمي الكمبيوتر في جامعة دمنهور.

أدوات جمع البيانات:
تم استخدام اثنين من الأدوات كما يلى:
الأداه الأولى : وهى استبيان بعمل مقابلة:
(الجزء ١) : اشتملت على البيانات الشخصية والاجتماعية كالسن والجنس ومستوى التعليم والدخل - بيانات عن التاريخ الصحى: وجود مرض طبي (ارتفاع ضغط الدم، ومرض السكري، هشاشة العظام)، يشكو من آلام الجسم. التاريخ المهني والتدريبات البدنية.
(الجزء ٢) : و تشمل تقييم الشكاوى الصحية لمستخدمي الكمبيوتر من موظفى الجامعة لتقييم مشاكل العضلات والعظام و برودة اليدين أثناء إدخال البيانات، وصعوبة في تحويل صفحات الكتاب، وصعوبة في تحويل مقابض الأبواب أو الصنابير، والاستيقاظ خلال الليل مع خدر أو ألم في اليدين وألم في اليدين والأصابع والإبهام أو الرسغ والكوع والذراع والكتف و مشاكل أو الم أعلى وأسفل الظهر، والتوتر الرقبة، آلام في في الفكين والأذنين والم او تورم بالكاحلين والقدم أو الأصابع، ألم أسفل الساقين.
(الجزء ٣): ويشمل تقييم معرفة مستخدمي الكمبيوتر عن إصابات الإجهاد المتكررة في ما يتعلق بممارسات استخدام الكمبيوتر والحوسبة الآمنة كتعريف إصابات الإجهاد المتكررة، عوامل الخطر، والأعراض، ومبادئ الوقاية من الاضطرابات ذات الصلة بالكمبيوتر.
الأداه الثانية: و هى استمارة ملاحظة :
(الجزء ١): تقييم ممارسات مستخدمى الكمبيوتر.
(الجزء ٢): تقييم تصميم أماكن العمل لمستخدمى الكمبيوتر.
تم تقسيم المشاركين فى البحث (٢٠٠ مستخدم للكمبيوتر) الى ٢٠ مجموعة و بكل مجموعة ١٠ مشاركين و تم تنفيذ البرنامج التعليمى بعمل عدد ٣ جلسات لكل مجموعة و التى تستغرق الجلسة ٤٥

دقيقة. كرست مناقشة أهداف الدورة والمحتوى. ثم، كان الوقت متاح للمشاركة والتفاعل للمستخدم الكمبيوتر. المدة الإجمالية لتنفيذ البرنامج كان خمسة أشهر و فى النهاية تم تقييم البرنامج بعد ٦ أشهر من تنفيذ البرنامج.

النتائج:

كانت النتائج الرئيسية للدراسة كالاتي:

- متوسط العمر ٢٨.٥ ± ٥.٩ سنوات، و الإناث تمثل أكثر من خمس المشاركين (٢٤.٥%) والباقي (٧٥.٥%) هم من الذكور.
- ٧٨.٠% من مستخدمى الكمبيوتر لم يكن يعاني من مشاكل صحية على الإطلاق. أولئك الذين لديهم تاريخ مرضى، ٥٤.٦ في المائة منهم لديهم ارتفاع ضغط الدم، و ١٦.٠% لديهم التهاب المفاصل الروماتيزمية. وعلاوة على ذلك، ٨٣.٥ في المائة العينة التي شملتها الدراسة لم تعاني من ألم في الجسم قبل استخدام الكمبيوتر وفقط (١٦.٥%) منهم اشتكى من الألم قبل أن يكون مستخدم للكمبيوتر. فيما يتعلق بموقع الألم، كان الأغلبية العظمى من مستخدمي الكمبيوتر (٨١.٨%) يعانون من الأم الظهر العلوي. بينما كان ٥١.٥% لديهم ألم بالرقبة و أكثر من ثلث يعانون ألم بالذراع و النسبة القليلة (٩.١%) تعانى من ألم بالساقين.
- متوسط الوقت لاستخدام الكمبيوتر كان ٧.١٩ ± ٠.٥٣١ عاماً. الأغلبية (٨٣.٠%) من العينة يعملون على جهاز الكمبيوتر على أساس يومي من ست سنوات إلى أقل من عشر ساعات.
- ٦٦.٥ في المائة من الموظفين لم يكونوا على معرفة مسبقة عن الممارسات الخالية من المخاطر عند استخدام الكمبيوتر مقارنة إلى ٣٣.٥ في المائة على علم مسبق.
- و فيما يتعلق بأثر برنامج التدريب التعليمي عن إصابات الإجهاد المتكررة على مجموع درجات المعارف عند مستخدمي الكمبيوتر. ولوحظ أن مجموع درجات المعارف لعينة الدراسة كانت أعلى بكثير في ما بعد التنفيذ (٧٦.٥٨ ± ٦.٦٥) من قبل تنفيذ البرنامج (٥٥.١٦ ± ١٤.٠٣)
- ومن المثير للاهتمام أن ٥٤.٥ في المائة من العينة المدروسة قبل تنفيذ البرنامج ذكروا أنهم كانوا يحصلون على استراحة أثناء العمل على الكمبيوتر؛ وهذا زاد بعد تنفيذ البرنامج الى ٨٤.٠%. وعلاوة على ذلك، ٣٠.٣ في المائة منهم كان يأخذ استراحة كل ساعة قبل تنفيذ برنامج ، هذه النسبة زادت إلى ٤٦.٤%.
- أما عن الممارسات الشاملة لمستخدمي الكمبيوتر يوجد تحسين ملحوظ بعد تنفيذ البرنامج. حيث أن أقل من الثلثين (٦٥.٠٪) من مستخدمي الكمبيوتر لوحظ يجلس على مبعدة من الجهاز في مرحلة ما قبل التنفيذ؛ وزادت هذه النسبة إلى ٩٧.٠٪ في التنفيذ بعد انتهاء البرنامج. و وجد أن الممارسات الجيدة ٨.٠٪ في ما قبل البرنامج وتحسينها لتكون ٣٦.١٪ في ما بعد تنفيذ البرنامج. بالإضافة إلى ذلك، كانت الغالبية (٧٥.٣٪) منهم ممارساتهم قبل البرنامج؛ هذا انخفضت النسبة إلى أقل من النصف (٤٦.٠٪) بعد تنفيذ البرنامج.

الخلاصة:

تبين ان البرنامج له تأثير إيجابي على المعارف والممارسات المتعلقة بالاستخدام الامن للكمبيوتر و إصابات الإجهاد المتكررة و أيضا تغيير نظام و بيئة العمل. وبالإضافة إلى ذلك، فإنه في مرحلة ما قبل تنفيذ البرنامج وجد أن حوالي ثلثي مستخدمي الكمبيوتر كانت علامات ممارساتهم عند استخدام الكمبيوتر سيئة و المتعلقة بمعلوماتهم الصحيحة حول ممارسات الحوسبة الخالية من المخاطر. في ما بعد تنفيذ البرنامج التعليمي، حدث تعزيز واضح لمعرفة المشاركين، وممارساتهم، وتعديل تصميم مكان العمل.

التوصيات:

وعلى ضوء نتائج هذه الدراسة فانه يمكن التوصية بالأتى:

- تعزيز دور وسائل الإعلام في المجتمع للتوعية بالممارسات الغير آمنة عند استخدام الكمبيوتر.
- وضع برامج عن الوقاية من إصابات الإجهاد المتكررة بين مستخدمي الكمبيوتر.
- مستخدمي الكمبيوتر يجب أن تكونوا مرخصين للعمل بعد التدريب عن ممارسات الحوسبة الآمنة.
- ينبغي أيضا أن توضع استراتيجيات معلنة للوقاية من إصابات الإجهاد المتكررة والموجهة لجميع الموظفين من مستخدمى الكمبيوتر.