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Effect of educational intervention on practicing correct body posture to decrease musculoskeletal disorders among computer users

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Abstract:

AIM AND BACKGROUND: Studies show that the risk of musculoskeletal disorders (MSDs) among computer users is more than the other occupations. The present study aimed to determine the effect of educational intervention based on the "stages-of-change" model on practicing the correct posture to reduce MSDs among computer user staff of Tehran University of Medical Sciences (TUMS).

METHODS: This is a quasi-experimental study which was carried out on 176 staff of TUMS. The study population was divided into two case and control groups, each including 88 participants. A self-structured as well as a standard questionnaire was used to collect the data. Data then were analyzed using descriptive and analytical tests.

RESULTS: There was no significant difference between both groups in terms of mean score of stages of change, perceived benefits and barriers, self-efficacy, and processes of change before the intervention. However, the mean score of these variables increased for case group 3 months after the intervention. In addition, case group participants reported lower MSDs in their neck, lower back, elbow, and knee compared to control group.

CONCLUSION: Ergonomic educational intervention based on the "stages-of-change" model has a positive impact on reduction of MSDs. Therefore, these disorders can be decreased through reducing working hours, changing the work conditions in accordance with ergonomic principles, dedicating some time for staff exercise, and holding educational courses for the personnel.

Keywords:

Correct posture, educational intervention, musculoskeletal disorders, stages-of-change model

Introduction

The growing advancement of modern technologies in human life has speeded up the processes of doing jobs and has increased the rate of production and productivity. However, it has also imposed some side effects such as inertia, fatigue, neurological-psychological pressures, and increased incidence of musculoskeletal disorders (MSDs) on people.[1] MSDs are the result of workplace risk factors along with doing physical activities at positions which are ergonomically unsuitable.[2] Such disorders are known as one of the most important reasons for work absences and disability in individuals. Moreover, almost one-third of health-care expenditures is the result of such disorders, and it has had an increasing trend since 1980.[3,4] Some of the most important occupational causes of these disorders include doing repetitive physical activities, wrong posture of the body while working as well as the stress due to local contact and standing position of body

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which all are created while working with computer.[5,6] Literature shows that computer users, compared to other occupations, are more likely to experience the risk of MSDs.[7] In addition, computer users are prone to develop the musculoskeletal symptoms with a prevalence of 50%.[8] Considering the various ergonomic exposures, working with computer can cause MSDs in different parts of the body such as the neck, shoulder, elbow, waist, and fingers.[9] According to a study in the US, the frequency of MSDs among computer users was 54%; this was especially seen among women and in their neck and shoulder.[10] Another study in Germany also showed that most of these disorders happen in the neck, shoulder, and elbow, and the symptoms for those who worked more than 6 h with computer were more severe.[11] Furthermore, in a national study by Bastani *et al*., the prevalence of these disorders among computer laboratory employees of a governmental organization was reported 48.2%; most of these disorders had happened in the neck (53%), waist (48%), and shoulder (12%).[12]

In a study by Pillastrini *et al*., the results revealed that those who had received information brochure as well as ergonomic interventions were more likely to experience lower pain and had less problems in the waist, neck, and shoulder.[13] In addition, Mohammadi and Mohammadi have also pointed out that educating people on having proper body postures has a significant effect on reduced MSDs.[14] Therefore, those who continuously work with computer should be educated to prevent from these disorders. There are different models for education depending on the goal of education. Transtheoretical Model (TTM) is one of these educational models which was introduced by Prochaska in 1979. Studies carried out using "stages-of-change" model have shown its positive effect on possibility of quitting cigar smoking, reduced alcohol use, doing mammography, and using proper body posture.[15] Nonetheless, this model has rarely been used in occupational health. According to this model, change is not an accident but a process, and people are at different stages of a change process.

This model measures an individual's readiness to act on a new healthier behavior through various stages of change including precontemplation, contemplation, preparation, action, and maintenance. The model consists of constructs such as ten-stage processes of change, self-efficacy, and decisional balance. Moreover, simultaneous use of all these steps provides a suitable guideline for implementing the interventions.[15]

Considering the high prevalence of MSDs among computer users as well as the importance of prevention from such disorders within workplaces, this study was prospected to determine the effect of implementing an educational intervention based on TTM on practicing proper body postures to reduce these disorders among computer users. The results of this study will be helpful in designing programs for educating people on having proper body postures during the work to prevent from MSDs.

Methods

This is a quasi-experimental study which was carried out on 176 computer user staff at Tehran University of Medical Sciences (TUMS) in 2015. Multistage random sampling was used to choose the samples. Among all of the administrative buildings of TUMS, central administrative building was selected as setting of the study. Then, upper and lower floors were randomly considered as control and case groups, respectively. There was no certain relationship between these two groups. Inclusion criteria were having at least a year work experience and more than 20 h of work per week – a benchmark for long work in occupational health. Moreover, exclusion criteria included having less than a year work experience and <20 h of work per week. In addition, we also excluded those who were suffering from any pain or discomfort due to having former medical disorders or those who had been suffering from MSDs before getting employed in their current organization. Data were collected using two standard questionnaires: nordic standard questionnaire which includes questions related to MSDs in the neck, shoulder, upper waist, wrist, lower waist, elbow, knee, hip, and foot. This questionnaire was developed by Kuorinka *et al*. at occupational health institute for Scandinavian countries. The second one was a self-structured questionnaire which was developed based on the "stages-of-change" model to improve the right body posture. This questionnaire includes demographic as well as special questions related to constructs of TTM (stages of change, perceived benefits, perceived barriers, self-efficacy, and processes of change). It includes 55 questions of which 12 are for demographic information, 1 related to stages of change, 7 for perceived benefits, 9 for perceived barriers, 6 for self-efficacy, and 20 related to processes of change. Question for "stages of change" was a five-choice question receiving the score 1 (the lowest) to 5 (the highest). Moreover, questions for perceived benefits and barriers were in Likert scale ranging from "completely agree" to "completely disagree". The least and the most score for perceived benefits ranged from 7 to 35. However, it was 9–45 for perceived barriers. In addition, "self-efficacy" questions were also in Likert scale ranging from "completely unsure" to "completely sure" with the least and the most score of 6–30, respectively. Finally, "processes of change" were measured using five-choice questions with answers ranging from "never" to "always" with the lowest and the highest score of

20–100. The validity of self-constructed questionnaire was approved using a ten-member expert panel and through content analysis, content validity rate, and content validity index. Furthermore, its reliability was tested through doing a study on 20 samples similar to the study samples along with doing test–retest ($r = 0.89$, for all constructs) and Cronbach's alpha ($r = 0.99$). At the first stage, researchers explained the objective of study as well as the confidentiality of collected data to the participants. Then, the questionnaires were filled out by both case and control groups, and the data gathered at this stage were analyzed. Next, after needs assessment and analysis of the results from stage 1, an educational intervention based on the constructs of TTM was carried out for 70 min through holding short lectures, question and answer meetings, group discussion, individual counseling, and provision of educational videos and pamphlets for case group. The control group did not receive any training. Both groups again completed the questionnaires 3 months after the intervention. Postintervention data were entered into SPSS 16 and were analyzed using descriptive (mean, standard deviation, and percentage) and analytical (independent *t*-test, paired *t*-test, Chi-square, and McNemar's test) tests.

Results

One hundred and seventy-six computer user staff of the central administrative building of TUMS participated in the present study. Of which 109 (61.9%) were female and the rest were male. Moreover, with regard to their marital status, 133 (75%) were married and the remaining were single. Considering their education, 54 (30.7%) had diploma, 24 (13.6%) with upper diploma, and the rest had bachelor or higher degrees. In addition, the mean and standard deviation of age, work experience, and working hours for case and control groups were 39.54 ± 8.81, 14.87 ± 7.62, and 8.29 ± 1.7 and 35.09 ± 7.43, 12.29 ± 7.78, and 8.1 ± 52.8, respectively. There seen no significant difference between both groups with regard to gender, age, education, work experience, and working hours.

As indicated in Table 1, the results of independent *t*-test showed that before the intervention, there was no significant difference between case and control groups in mean score of stages of change, perceived benefits, perceived barriers, self-efficacy, and processes of change. However, there seen a major difference between both groups after the intervention ($P < 0.001$).

Furthermore, there was no significant difference between case and control groups with regard to the mean score of stages of change ($P = 0.652$); however, the mean score of case group increased after the intervention ($P < 0.001$). Moreover, the results of paired *t*-test revealed that the intervention had statistically significant effect on case group ($P < 0.001$), but the mean score for control group had stayed almost the same as preintervention ($P = 0.366$) [Table 1].

There was no major difference between both groups concerning the mean score of perceived benefits before the intervention ($P = 0.918$); however, the results of independent *t*-test showed that the mean score of case group increased after the intervention and there seen a significant difference between both groups in this regard ($P < 0.001$). According to paired *t*-test, case group showed dramatic changes for this item ($P < 0.001$), whereas this was not significant for control group ($P = 0.713$) [Table 1].

Considering the perceived barriers, self-efficacy, and processes of change, there was also no significant difference between both groups with regard to these items before the intervention; however, the intervention

Table 1: Mean and standard deviation of case and control group's variables before and after the educational intervention

Variable	Time period	Case group (88 people)	Control group (88 people)	Significance level
Stage of change	Preintervention	2.28±0.99	2.35±1	0.652
	Postintervention	3.81±0.71	2.30±0.97	*P*<0.001
	P	*P*<0.001	0.366	
Perceived benefits	Preintervention	20.67±6.41	20.6±56.80	0.918
	Postintervention	27.02±5.81	20.56±6.54	*P*<0.001
	P	*P*<0.001	0.713	
Perceived barriers	Preintervention	24.35±40.35	23.5±90.46	0.541
	Postintervention	34.6±51.76	24.09±5.46	*P*<0.001
	P	*P*<0.001	0.105	
Self-efficacy	Preintervention	14.54±0.29	14.4±31.20	0.777
	Postintervention	22.4±48.64	14.4±48.22	*P*<0.001
	P	*P*<0.001	0.843	
Processes of change	Preintervention	48.9±23.32	49.6±86.99	0.193
	Postintervention	71.17±88.18	50.7±61.06	*P*<0.001
	P	*P*<0.001	0.595	

had a major influence on case group, but the mean score of control group was not affected [Table 1].

As shown in Table 2, there seen no significant difference between case and control groups concerning the frequency of MSDs; however, the frequency of pain in the neck, waist, knee, and elbow reduced after the intervention. Moreover, the results of Chi-square test showed a significant difference between case and control groups with regard to the frequency of pain in above-mentioned parts of the body after the intervention. In addition, case group reported lesser pain compared to preintervention period. Furthermore, McNemar's test revealed that although there was a significant difference between frequency of pain in the neck, waist, lower back, knee, and foot before and after the intervention for case group, control group experienced no change after the intervention.

Discussion

Education through "stages-of-change" model improves the stage of change and enhances the perceptions of benefits, barriers as well as self-efficacy, and processes of change regarding practicing correct posture and its effect on reduction of MSDs.

According to the results of our study, both groups reported having pain in the neck, shoulder, waist, back, and knees before the educational intervention. However, postintervention results showed that case group participants reported a decreased pain in the neck, waist, knee, and elbow, but there was no change in the pain of shoulder and hip. Although education has a positive effect on practicing correct body posture, reducing MSDs require personal and ergonomic protection equipment. Such equipment was not provided for the study population over the study period. On the other hand, analysis of the posteducation results showed a positive change in stages of change, improved perceived benefits and barriers, self-efficacy, and processes of changes regarding practicing correct body posture. These results magnify the significant effect of education on reduced MSDs.

Results of a study by Moazzami and Soltanian on practicing correct posture among nurses showed that education changes the mean score of self-efficacy, processes of change, and reduces the related barriers.[16] Furthermore, Solhi *et al*. reported that educating pregnant women had a positive impact on the mean score of their perceived benefits.[17] In addition, according to

Table 2: The frequency of musculoskeletal disorders among case and control groups before and after the intervention

Type of MSDs	Time period	Case group (88 people)	Control group (88 people)	Significance level
Neck	Preintervention	39	41	0.762
	Postintervention	22	45	*P*<0.001
	P	*P*<0.001	0.152	
Shoulder	Preintervention	30	35	0.435
	Postintervention	27	33	0.34
	P	0.25	0.5	
Waist	Preintervention	36	37	0.878
	Postintervention	19	39	0.001
	P	*P*<0.001	0.774	
Back	Preintervention	31	24	0.255
	Postintervention	25	26	0.868
	P	0.031	0.652	
Knee	Preintervention	24	28	0.509
	Postintervention	19	38	0.002
	P	0.006	0.062	
Foot and hand wrist	Preintervention	19	21	0.719
	Postintervention	14	19	0.344
	P	0.062	0.5	
Feet	Preintervention	17	15	0.696
	Postintervention	12	18	0.299
	P	0.006	0.062	
Hip	Preintervention	9	16	0.131
	Postintervention	12	16	0.410
	P	0.25	0.19	
Elbow	Preintervention	9	10	0.808
	Postintervention	6	15	0.034
	P	0.25	0.062	

MSDs=Musculoskeletal disorders

Moeini *et al*., education had significant positive effect on self-efficacy and decisional balance. It had also increased the process of doing sports activities for experimental group.[18] Moreover, Munchaona pointed out that intervention reduced the musculoskeletal pain among experimental group compared to control group.[19] According to Robertson *et al*., educating employees about ergonomic issues improve their knowledge and skills on considering correct posture, and they are more likely to act on changing their wrong body postures.[20] Literature has shown that holding educational sessions about correct body postures play a crucial role in decreasing the MSDs, especially in feet.[21]

According to Mohammadi Zeidi *et al*., educational intervention had a significant effect on case group regarding the stages of change, attitude, perceived behavioral control, and ergonomic knowledge. It reduced the percentage of MSDs from 40% to 33% for experimental group. However, it decreased the incidence of these disorders from 40.11% to 40% in control group. As it is obvious, education plays an important role in decreasing MSDs; therefore, it is essential to educate those who use computers through holding in-service training.[14]

Results of the present study showed that the mean score of stages of change for experimental group employees increased dramatically after the intervention, whereas it did not have any impact on control group. Keller *et al*., argues that individuals pass various stages to accept a behavior, so educational approaches should identify any possible barrier or use proper interventions to guide them into next stage.[22] These results are also in consistent with the results of a study by Mohammadi Zeidi.[14]

A behavior happens when we give more importance to its perceived benefits than its perceived barriers. Results of the present study indicated that the mean score of perceived benefits for case group increased after educational intervention; however, there seen no change in control group regarding this variable. This was also pointed out by Solhi *et al*.[17] In addition, Moeini *et al*. reported that educational intervention increased the decisional balance.[18]

According to the findings of the present study, there was a significant difference between both groups concerning the mean score of perceived barriers. In other words, educational intervention reduced the perceived barriers for case group. These results are also in consistent with the findings of Moaazami's study.[16] Moreover, although there was an increase in the mean score of self-efficacy variable for case group after the intervention, there was no significant change in control group. Abareshi also mentioned this in another study.[23]

Processes of changing the activities are strategies which help the individual move forward in the stages of change. Findings of the present study indicated that the educational intervention raised the mean score of processes of change for case group but did not have any effect on control group. These findings have also been pointed out by Moazzami and Soltanian.[16]

Furthermore, the intervention reduced the frequency of MSDs in the neck, elbow, waist, feet, and knee for case group. In other words, educating participants on practicing correct body posture through "stages-of-change" model had decreased MSDs. This was also observed by Munchaona.[19] In addition, Wu *et al*. also reported a reduction in the prevalence of MSDs after the intervention, especially in feet.[21] In another study, results showed that the total incidence of MSDs for case group had reduced from 40% to 35.33%; however, this was not really significant for control group.[14] Moreover, Choubine *et al*. also stated a significant decrease in the prevalence of waist and lower back pain for case group after the intervention.[24]

Conclusion

Considering the findings, emphasizing the educational intervention, to maximize the benefit of its impact in proper posture, simultaneously use of other interventions such as equipping personnel offices to auxiliary equipment (including chairs and desks with regard to ergonomic principles and using suitable footrest stands), decreasing the working hours, dedicating some time for staff exercise, and holding educational courses for personnel is necessary. These actions can lead to reduced MSDs.

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Conflicts of interest

There are no conflicts of interest.

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