Exercise Reminder Software for Office Workers

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Abstract. Computers are widely used instruments in workplaces. Despite the low level of physical load, computer usage requires repetitive motions and staying in same position for a long time. That's why great number of computer users may contract musculoskeletal disorders. Frequent rests can prevent musculoskeletal discomfort, but OW generally do not break their work until discomfort occurs. The rest breaks can be reminded by computer software. The purpose of this study was to develop exercise reminder software (ERS) for OW in Turkish Language. An exercise protocol was designed to prevent most common MSDs among OW. The software was designed under C# with video play, exercise description and exercise log properties and the source code is open for scientific purpose. The software is compatible with Windows XP and Vista. The developed software is the first known ERS in Turkish Language. Future studies may focus on integration of distance patient follow up systems.

Keywords: computer software, exercise reminder, office workers.

1 Introduction

Computers are widely used instruments in workplaces. When office workers (OW) use this instrument, they do not need high level of energy consumption but they have to stay in the same position for a long time and they have to do repetitive movements (1). Staying a static posture can change normal force distribution on joints of human body and may cause strains of human skeletal muscles (2). Repetitive movements can cause micro trauma on different type of tissues of human locomotion system. Both of the situations will cause degrease work performance and increases health expenses.

To overcome these problems, ergotherapists study on preventive methods for OW. Some of the classical approaches are rearrangement of work place, ergonomic education of OW, preventive exercise programs and frequent rests (1).

Frequent rests and preventive exercise programs have important role on prevention of musculoskeletal disorders (MSDs) among OW, but they generally do not break their work until discomfort occurs and they do not go on exercise programs regularly if supervision is unavailable or insufficient.

To remind these rest breaks and supervise exercises by computer software become a popular method in recent years (1). These method have some advantages over classical approaches like cost effectiveness and degreased need for direct supervision. In addition

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American Ergotherapy Association (AOTA) suggests use of exercise reminder software (3). But exercise reminder software is not common in languages other than English.

It couldn't be succeed to find any exercise and rest break reminder software for Turkish OW in the literature. The purpose of this study was to develop exercise reminder software for OW in Turkish Language.

2 Material and Methods

Exercise Protocol. Therapeutic exercise was defined by DeLateur as "the prescription of bodily movement to correct impairment, improve musculoskeletal function or maintain a state of well-being" (4). For these purposes, therapeutic exercises can include stretching, strengthening or cardiovascular components. These exercises can be done in laying, standing or sitting position. Also tools like elastic resistance, balls and free weights can be used when doing the therapeutic exercise.

OW are generally effected by MSDs which generally includes the involvement of spinal column and upper extremities. Musculoskeletal pain and joint stiffness are common complaints. Stretching exercises can degrease the complaints and prevent OW for future impairment (5). Also strengthening exercises should be included in the exercise protocol to maintain adequate function and maintain a state of well being. Cardiovascular exercises are helpful to improve endurance, maintain emotional well being and help to overcome stress in the work places. Cardiovascular exercises include walking, swimming and cycling like activities and it is difficult to do them in office conditions.

The therapeutic exercise protocol was planned according to most common MSDs in OW which included preventive exercises that can be done in office conditions with no specific exercise tools. The protocol consists of gentle and mild level stretches and low level strengthening exercises. The frequency of the exercise was 1 exercise per 45 min.

Software. Two databases were designed. One for exercise descriptions and one for exercise logs. Exercise description database includes information about video file of each therapeutic exercise, exercise description for OW and exercise description for ergotherapist. Exercise log database includes information about OW performance about exercise program. Algorithm was designed to provide flexibility to the user to continue exercise program from the last exercise he/she didn't complete last time. The code was generated under C# (Microsoft Visual Studio 2008).

User interface and exercise descriptions were in Turkish Language. The source code of the software is open for scientific purposes and it is possible to translate interface and exercise descriptions in other language without commercial use under the permission of authors.

The software was tested under Windows XP and Vista.

Target Population for the Software. The software was designed for general OW. The software was first applied on stenographers who work in Turkish Parliament. Stenographers are high level office workers who work on computer with time limit. They have to complete their work in given time.

Satisfaction of the Software. The user satisfaction was assessed by a 13 item questionnaire. (1)

3 Results

The developed software includes a database for exercise descriptions and a database for exercise logs. 53 office exercises were recorded 1280-720 pixel resolution, 1048 kps video data rate and 24 bit video sample with no voice. This was done to not affect the conditions of work place. Exercise descriptions were presented as text next to video box.

The software reminds exercises per 45 minutes. Software minimizes itself to task bar after OW has completed the exercise routine. OW can give feedback as "I did the exercise" and "I didn't do the exercise". If OW the feedback is "I didn't do the exercise" the software begins from this exercise next time it come to the screen.

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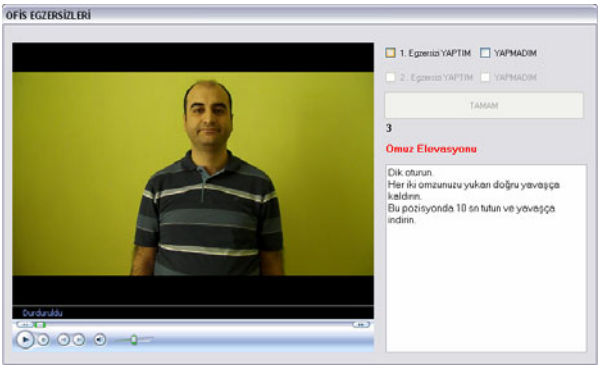

Fig. 1. User Interface

The software was tested under Windows XP and Vista in experimental conditions and found compatible with these operating systems. Real condition test was done in Turkish Parliament, department of record office on stenographers. No technical problem was observed if NET Framework 3.5 or higher was initially installed.

User satisfaction questionnaire was applied on 11 (8-73% Male, 3-27% female) OW whose mean age was 43±11 and mean working experience was 21±13 years. 8-73% of the participants were stenograph, 1-9% was expert stenographer and 2-18% were government official. The participants predicated that they used software 6±3 times per day and 11-100% of them suggest the software to their colleagues. Other statistics are presented in Table 1.

Table 1. Results of user satisfaction questionnaire

Item	Empty	Very Positive	Positive	Negatively	Very Negatively	Total Answers
Effect on overall productivity	1 11%	1 11%	8 89%	-	-	9
Item	**Empty**	**Very Easy**	**Easy**	**Hard**	**Very Hard**	**Total Answers**
Easy to use	-	5 45%	5 45%	1 9%	-	11
Exercise instructions easy to follow	-	2 18%	9 82%	-	-	11
Item	**Empty**	**Very Helpful**	**Helpful**	**Somewhat Helpful**	**Not at all Helpful**	**Total Answers**
Video helpful in following the exercises	-	5 45%	5 45%	1 9%	-	11
Item	**Empty**	**Very Satisfied**	**Satisfied**	**Unsatisfied**	**Very Unsatisfied**	**Total Answers**
Overall Satisfaction	-	4 36%	5 45%	2 18%	-	11

4 Conclusion

User satisfaction questionnaire was done on a limited population but 89% of the users predicated that the software has positive effect on their overall productivity.

The developed software is the first known ERS in Turkish Language. As previous studies of the authors the source code is open for scientific purposes under the permission of authors. This may help to develop exercise reminder software in languages other than English. Language of user interface and exercise descriptions is one of the important topics on access and adaptation of the software user.

In this version, databases are offline. The ergotherapist collects log data per week by copying database to a flash memory. Also if there will be a need to make modification on exercise description or exercise video this should be done by manual access. These are the limitations of the current version.

Future studies may focus on to develop online database functions for ergotherapist and integration of distance patient follow up systems.

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