SHORT-TERM EFFECTS OF HIGH INTENSITY SHOULDER ELEVATION DURING COMPUTER WORK

Karen Søgaard[1], Mette K. Larsen[2], Afshin Samani[2,3], Pascal Madeleine[3], Henrik B. Olsen[2], Andreas Holtermann[2]

[1]Institute of Sports Science and Clinical Biomechanics, University of Southern Denmark, Odense, Denmark

[2]National Research Centre for the Working Environment, Copenhagen, Denmark

[3]Laboratory for Ergonomics and Work-related Disorders, Center for Sensory-Motor Interaction (SMI), Department of Health Science and Technology, Aalborg University, Aalborg, Denmark

INTRODUCTION

Work-site strength training sessions are shown effective to prevent and reduce neck-shoulder pain in computer workers, but may be difficult to integrate in normal working routines [1,2].

A possible solution may be to implement high intensity voluntary contractions during computer work to prevent neck-shoulder pain. It is, however, unknown how this may influence productivity, rate of perceived exertion (RPE) as well as muscle activity and relative rest time (RRT) during work and pauses.

The aim of this study was to investigate short-term effects of a high intensity contraction on productivity, RPE as well as upper trapezius activity and RRT during computer work and subsequent pause.

METHOD

Eighteen female computer workers with mean (SD) age 41.8 (7.8) years, height 1.70 (0.07) m, weight 74.4 (14.9) kg, and body mass index 26.1 (6.0) participated in the study.

Subjects were seated on a height-adjustable chair at a table with appropriate arm support. Two dynamometers were attached on each side of the chair enabling bilateral isometric maximal voluntary contractions (MVC) of shoulder elevation.

Two randomised sessions of computer mouse work were performed. Each lasted 15 min, starting and ending with 1 min pause. One session started with a single MVC trial of shoulder elevation followed by 1 min pause and 15 min of computer mouse work. The other session was identical, but without a preceding MVC.

RPE were obtained using Borg´s CR 10-scale of the dominant neck-shoulder region during the end of each session of computer mouse work and each pause.

Surface EMG were recorded from the clavicular and the descending parts. Signals were amplified, analogue band-pass filtered, AD converted, visually verified, high-pass filtered and root-mean-square (RMS) converted. Signal resting level were subtracted and the signal normalized to $EMG_{max.}$. Average RMS from 5 minutes of each computer sessions and the subsequent pause were calculated as well as RRT based on the total duration of EMG activity <0.5% EMG_{max}

Effect of MVC and time, were tested with a full-factorial repeated measure analysis of variance. The level of significance was set to $p<0.05$.

RESULTS

A significant reduction in RPE was found in the pauses compared to computer mouse work, but there was no significant effect of the preceding MVC. ($p=0.56$).

During the 1 min pause after a session of computer work, EMG activity was 1.6±1.6 %EMG_{max} in the clavicular, and 1.5±0.8%EMG_{max} in the descending part of the trapezius, while the average RRT was 42.0±39.9% in the clavicular, and 26.4±34.5% in the descending part. In the clavicular muscle part there was a significantly lower RRT in the session with MVC compared to the session with no MVC ($p<0.04$).

During computer work the average EMG activity was 3.0±2.5%EMG_{max} in the clavicular, and 3.3±1.5%EMG_{max} in the descending part of the trapezius with no effect of preceding pause type. The average RRT was 11.7±23.0% in the clavicular, and 3.2±4.9% in the descending part of the trapezius with no effect of pause type.

Regarding productivity the subjects finished less drawings in the last 5 (49.1±5.3) compared with the first 5 min of computer work (50.3±6.0), ($p<0.01$) but no significant effect of a MVC was found ($p=0.52$).

DISCUSSION AND CONCLUSION

During computer work no negative effects of a single high intensity shoulder elevation contraction on perceived effort, productivity or EMG activity and RRT of the upper trapezius were observed. Therefore, implementation of high intensity voluntary contractions during computer work could be a well suited approach for preventing neck-shoulder pain in computer workers. However, the reduced RRT of the clavicular part of in the pause after an MVC requires further investigation before high intensity shoulder elevations can be recommended as an integrated part of computer work.

REFERENCES

1) Andersen LL, Kjaer M, Søgaard K, Hansen L, Kryger A, Sjøgaard G: Effect of two contrasting types of physical exercises on chronic neck muscle pain. Arthritis Rheum 2008, 59: 84-91.

2) Blangsted AK, Søgaard K, Hansen EA, Hannerz H, Sjøgaard G: One-year randomized controlled trial with different physical-activity programs to reduce musculoskeletal symptoms in the neck and shoulders among office workers. Scandinavian Journal of Work Environment & Health 2008, 34: 55-65.