Physical exposure, musculoskeletal symptoms and attitudes related to ICT use

Akademisk avhandling

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av
Ewa Gustafsson

Fakultetsopponent:
Docent Lena Sperling
Lunds Tekniska högskola, Lund

The thesis is based on the following papers:

I Gustafsson E., Dellve L., Edlund M., Hagberg M. The use of information technology among young adults – experience, attitudes and health beliefs. *Applied Ergonomics* 2003; 34, 565-570.

II Gustafsson E., Hagberg M. Computer mouse use in two different hand positions: exposure, comfort, exertion and productivity. *Applied Ergonomics* 2003; 34, 107-113.

III Gustafsson E., Johnson P.W. Hagberg M. Thumb postures and physical loads during mobile phone use – A comparison of young adults with and without musculoskeletal symptoms. *J Electromyography and Kinesiology* (2009), doi:10.1016/j.jelekin.2008.11.010 *Epub ahead print*

IV Gustafsson E., Johnson P.W., Lindegård A., Hagberg M. Texting on mobile phones – Are there differences in postures and working techniques between young adults with and without musculoskeletal symptoms?
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Physical exposure, musculoskeletal symptoms and attitudes related to ICT use

Ewa Gustafsson
Occupational and Environmental Medicine
School of Public Health and Community Medicine
Institute of Medicine, University of Gothenburg

Abstract

High prevalence of musculoskeletal symptoms/disorders in neck and upper extremities are reported among computer users. Considering the widespread use of information and communication technology (ICT) and mobile phones becoming more and more like computers with small keyboards it is of importance to identify the factors and conditions related to this use, that influence our health. The overall aim of this thesis was to obtain new ergonomic knowledge of the physical exposure associated with the use of information and communication technology with emphasis on small keyboards, computer mice and young adult ICT users. In an interview study with young adult ICT users, where the data analysis was performed with the grounded theory method, was showed that the young adults experienced ICT as a tool for being and acting in the present, to be social, efficient and independent with almost unlimited opportunities but also risks. A comparative experimental study with experienced computer mouse users evaluated muscle activity with surface electromyography and wrist positions/movements with electrogoniometry during work with a traditional flat computer mouse (pronated hand position) and a vertical computer mouse (neutral hand position). Work with the vertical computer mouse decreased the muscle activity in the extensor muscles in the forearm and in the first dorsal interossei muscle, and the ulnar deviation in the wrist compared to the traditional mouse. An experimental study, with young adults with and without musculoskeletal symptoms from neck and/or upper extremities, evaluated thumb positions/movements with electrogoniometry, muscle activity with surface electromyography, and working techniques with an observational protocol when text entering on a mobile phone. The young adults with symptoms had lower muscle activity in the abductor pollicis longus and tended to have higher velocity and fewer pauses in the thumb movements compared to those without symptoms. Females had higher muscle activity in the first dorsal interossei and the abductor pollicis longus compared to males. It was more common in the group with symptoms to sit with the head bent forward, to sit without forearm and back support and to enter text with one thumb rather than two compared to those without symptoms. Use of forearm support decreased the muscle activity in the trapezius muscles. Use of one hand grip increased the muscle activity in the extensor muscles in the forearm. High observed velocity in the thumb movements was associated with increased muscle activity in the extensor muscles in the forearm compared to low or moderate velocity.

In conclusion, this thesis shows that computer mouse design has an effect on the muscle activity in the forearm and hand, and on the wrist positions and movements. It also shows that the individual factors working technique and gender have an effect on muscle activity and thumb movements when entering text on a mobile phone. Furthermore, there were differences in working techniques, thumb movements, and muscle activity between the young adults with musculoskeletal symptoms in the neck and upper extremities and those without symptoms.

Key words: Input device, Wrist movements, Electrogoniometry, EMG, Muscle activity, Thumb movements, Working technique, Information and communication technology, Computer mouse, Mobile phone

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