

**Working technique during computer work
Associations with biomechanical and psychological strain, neck and upper extremity
musculoskeletal symptoms**

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This thesis is based on the following papers:

- I Lindegård A, Wahlström J, Hagberg M, Hansson G-Å, Jonsson P, Wigaeus Tornqvist E. The impact of working technique on physical loads – an exposure profile among newspaper editors. *Ergonomics* 2003; 48:135-42.
- II Wahlström J, Lindegård A, Ahlberg G Jr, Ekman A, Hagberg M. Perceived muscle tension, emotional stress, psychological demands and physical load during VDU work. *Int Arch Occup Environ Health* (2003) 76:584-590.
- III Lindegård A, Karlberg C, Wigaeus *Tornqvist* E, Hagberg M, Toomingas A. Concordance between VDU-users' ratings of comfort and perceived exertion with experts' observations of workplace layout and working postures. *Appl Ergon*. 2005 May;36(3):319-25.
- IV Lindegård Andersson A, Wahlström J, Hagberg M, Toomingas A, Wigaeus Tornqvist E. The influence of working technique, comfort and perceived exertion on the incidence of upper extremity symptoms among VDU-users. *Submitted*
- V Lindegård Andersson A, Ekman A Reply to short communication by T.PHuchinsson regarding "Concordance between VDU-users' ratings of comfort and exertion with experts' observations of work place layout and working postures" Technical note. *In press Applied Ergonomics*



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Abstract

About 35 % of the working population in Sweden report that computer use accounts for 50% or more of their total working hours. Among this population approximately 40% of the women and 25% of the men experienced symptoms in the neck and/or upper extremities at least once a week during the preceding 3 month. The overall aim of the studies underlying this thesis was to explore possible associations between working technique and perceived exertion, comfort, biomechanical and psychosocial strain as well as neck and upper extremity symptoms among computer users. Specific research questions addressed were

- a) Whether working technique was associated with muscle activity, wrist positions and forces applied to the computer mouse, respectively?
- b) Whether working technique was associated with psychological demands, emotional stress and perceived muscle tension, respectively?
- c) Whether there were associations between self-rated perceived comfort and observations of workplace layout and between self-rated perceived exertion and working postures.
- d) Whether working technique, perceived exertion and comfort, respectively, were associated with neck and upper extremity musculoskeletal symptoms.

The results showed that subjects classified as having a good working technique worked with less muscular load in the forearm ($p=0.03$) and in the trapezius muscle on the mouse operating side ($p=0.02$) compared to subjects classified as having a poor working technique. Subjects who reported high psychological demands and perceived muscular tension, respectively, used poorer working technique than subjects who did not perceive these conditions (demands, $p=0.03$, muscular tension, $p=0.02$). Moreover, the concordance between ratings of comfort and observations of workplace layout was reasonably good concerning the working chair and the keyboard and good regarding the computer screen and the input device. The concordance between ratings of perceived exertion and observations of working postures indicated good agreement for all measured body locations. This applies to the group that rated poor comfort and high exertion. Regarding the group that rated good comfort and low exertion ratings must be supplemented with observations. Furthermore, the results revealed that high perceived exertion and low comfort were related to an increased incidence of neck, and upper extremity symptoms, while poor working technique was not associated with such a risk.

It is concluded that working technique is associated with both biomechanical and psychological strain while no associations could be seen between working technique and the incidence of neck and upper extremity symptoms. Furthermore, high perceived exertion and low comfort are related to an increased incidence of neck and upper extremity musculoskeletal symptoms.

Keywords: Working technique, Computer users, Observation assessments, Perceived exertion