

CAN VISUAL DISCOMFORT INFLUENCE ON MUSCLE PAIN FOR VISUAL DISPLAY UNIT (VDU) WORKERS?

Aarås, A¹, G. Horgen¹, M. Helland¹

¹Department of Optometry and Visual Science,
Buskerud University College, P.O. Box 251, N-3603, Kongsberg, Norway
Arne.aaras@hibu.no

In three different prospective epidemiological studies, correlation between visual discomfort and average pain intensity in the neck and shoulder, were $0.30 < r < 0.72$ for VDU workers. In the first study, correlation between visual discomfort and pain in the neck and shoulder was $0.30 < r < 0.40$. In the second study, ($r=0.40$, $p=0.003$). In the third study, correlation for neck pain ($r=0.69$, $p=0.000$) and shoulder pain ($r=0.72$, $p=0.000$).

VDU workplaces. Lighting conditions, Visual conditions, Visual discomfort, Musculoskeletal illness.

1 Introduction

Visual discomfort has a high prevalence for VDU workers (Horgen, G. and Aarås, A. 2003). Eye discomfort is related to VDU work according to Bergqvist and Knave. They found that symptoms of gritty feeling or redness of the eye as well as sensitivity to light were associated with VDU work (Bergqvist, U. and Knave, B. 1994). Bergqvist et al. documented also a positive dose-response association between eye discomfort and VDU use (Bergqvist, U. et al. 1992). Furthermore, Sjøgren and Elfstrøm found that the frequency of eye discomfort was related to working time at the VDU (Sjøgren, S. and Elfstrøm, A. 1989). Both lighting conditions and optometric corrections are documented to be important to reduce visual discomfort (Aarås, A. et al. 1998). Glare has significant correlations to eye focusing problems and tired eyes (Hedge, A., Williams, R. S. J., and Franklin, D. B. 1995). In a laboratory study by Sheedy and Bailey, glare from a luminarie in the upper visual field was examined. Subjective rating of light discomfort was strongly related to the luminance level of the glare source. Further, the glare magnitude was significantly related to asthenopic symptoms ($p=0.004$) and musculoskeletal symptoms ($p=0.017$) (Sheedy, J. E., and Bailey 1995). Horgen et al. has shown that optometric corrections reduced visual discomfort and musculoskeletal pain in VDU workers (Aarås, A. et al. 1998). More details regarding VDU work and health consequences for such work are given by Aarås, A., Horgen, G and Ro, O. (2000). Punnet and Bergqvist reported very frequently pain in the musculoskeletal system for VDU workers (Punnet, L. and Bergqvist, U. 1997). Static muscle load, high frequency of repetitive movements and high force requirements of these movements seem to be predictors for onset of musculoskeletal discomfort (Mikkelsen, S. et al. 2001). Duration of repetitive movements of the upper arm was found to be associated with neck and shoulder symptoms (Mikkelsen, S. et al. 2001).

2 Aims of the studies.

The aims of these studies were to investigate the correlation between visual discomfort and pain in the upper part of the body. Longitudinal epidemiological studies were

performed to evaluate the aims (Aarås, A. et al. 1998; Aarås, A., Horgen, G. and Helland, M. 2005).

3 Methods and Procedures

Questionnaires

These dealt with headache, visual conditions and discomfort as well as musculoskeletal pain, organizational and psychosocial factors were implemented by the participants. The questionnaires were administered by the local health security officer, filled in individually, and returned anonymously in a sealed envelope to the company's medical doctor. All questions were assessed by the participants as an average intensity for the previous six months. The same questionnaires were answered once more after lighting intervention and optometric intervention. The factors were measured on a 100 mm Visual Analog Scale (VAS) (Larsen, S., Aabakken, L., Lillevold, P.E. and Osnes, M. 1991; Du Toit, R. et al. 2002) A detailed description of the questionnaires and procedures of measuring lighting variables as well as musculoskeletal and optometric parameters are given by Aarås et al (1998); Aarås, A., Dainof, M.J. and Thoresen, M. (2002).

Postural load

Muscle load was measured by EMG from musculus trapezius and infraspinatus (Aarås, et. al. 1996).

Postural angles

Dual inclinometers were used to measure postural angles of the head, upper right arm and back (Hagen, K.B., Sørhagen, O. and Harms-Ringdahl, K. 1994).

3.1 *The first prospective epidemiological study.*

This was a prospective epidemiological study where VDU workers were followed for a period of six years (Aarås et al. 2001). Visual discomfort showed a relationship with pain intensity in the neck and shoulder ($0.30 < r < 0.40$). The level of discomfort/pain was assessed on a Visual Analogue Scale (VAS). Visual discomfort was 29.9 (21.7– 38.09) and shoulder pain 23 (15.3– 30.7) as group mean with 95 % Confidence Interval (CI). Zero was no pain 100 indicated extreme or unbearable pain. However, such studies have a lot of confounding factors such as organizational and psychosocial factors. For all psychosocial factors, there was no statistical intervention effect or time effect and no interactions between time and intervention were found.

3.2 *The second prospective epidemiological study.*

This study was a multidisciplinary multinational ergonomic study MEPS (Musculoskeletal-Eyestrain – Psychosocial – Stress). The objective of the study was to examine the effects of various kinds of ergonomic interventions including corrective lenses on a combination of musculoskeletal, postural, and psychosocial outcomes among VDU workers. In this study, visual discomfort was related to neck pain, $r=0.40$, $p=0.003$; regression coefficient 0.37 with CI of 0.18-0.57. Neck pain was also related to burning and itching of the eye ($p=0.004$). Headache was related to visual discomfort, ($r=0.34$, $p=0.01$).

3.3 *The third prospective epidemiological study.*

This is the same study as described in 2.1, where the follow up period covers from 6 to 13 years. The results showed a significant correlation between visual discomfort and neck pain ($r=0.64$, $p=0.000$) as well as shoulder pain ($r=0.56$, $p=0.001$). For the forearm this correlation was weaker, but still significant ($r=0.35$, $p=0.04$). In a multivariable regression model when lighting and glare were excluded, visual discomfort explained 53 % of the average of the neck and shoulder pain (Helland, M. et al. 2006).

4 Conclusion

Three different prospective epidemiological studies have shown that there is a clear indication of a relationship between visual discomfort and pain in the neck and shoulder. In one of the study, visual discomfort explained 53% of the variance of the neck and shoulder pain in VDU workers.

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