DOES VISUAL DISCOMFORT HAVE AN INFLUENCE ON MUSCLE PAIN FOR VISUAL DISPLAY UNIT (VDU) WORKERS?

Aarås, A¹, Horgen, G¹, Helland, M¹, Kvikkstad, T. M¹.

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

Abstract
In four different prospective epidemiological studies, correlation between visual discomfort and average pain intensity in the neck and shoulder varied between 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 was for neck pain (r=0.69, p=0.000) and for shoulder pain (r=0.72, p=0.000) respectively. In the fourth study, correlation for neck pain was (r=0.44, p=0.038).

Keywords: Visual discomfort, muscle pain, VDU work.

1. Introduction
Lighting conditions and optometric corrections must be optimised to keep visual discomfort at an acceptable level [1, 2, 3,]. Luminance and its distribution in the room are important for avoiding contrast glare. Luminaries with both direct and indirect lighting give better luminance distribution and better visual condition compared to only direct lighting [4]. Screen and surface glare have been found to correlate significantly with eye focusing problems and tired eyes [4]. Further, visibility may be reduced if objects with high luminance are seen directly, or reflected in the screen [5]. Corrections of hypermetropia and astigmatic errors have been documented to reduce the visual discomfort for VDU workers [6]. Optometric corrections, if needed, must be given according to work task analysis [7] because they may influence both body posture and postural load [8, 9].

Epidemiological literature has indicated a relationship between VDU work and musculoskeletal complaints in the neck, shoulder and upper extremity [10]. Static muscle load, high frequency of repetitive movements and high force requirements of these movements seem to be predictors of onset of musculoskeletal discomfort [11, 12]. Duration of repetitive movements of upper arm was found to be associated with neck and shoulder symptoms [13]. There are indications of an exposure-response relationship between typing time on a keyboard and risk of upper extremity symptoms [14]. It has also been shown that upper extremity symptoms are more frequent in the mouse operating hand compared with the other arm and hand [15]. An association between neck and upper extremity symptoms with hours per day of mouse use has been found [16]. The odds ratios for developing symptoms with prolonged mouse use were 2.2 or higher for shoulder, upper arm, elbow, wrist and hand/fingers for computer-aided design (CAD) operators compared with telecommunication laboratory workers. The risk of tension neck syndrome increased four-fold when the weekly hours spent with a computer mouse exceeded 25 hours a week compared to no/minor mouse use. A similar relationship was also found between the pain level in the forearm and the total time using the mouse [17]. Neutral position and support of the forearm reduced the pain in the upper extremity [18, 19, 20]. Psychosocial factors such as time pressure and a high perceived work load interact in the development of upper extremity and neck symptoms [21, 22]. Lighting design, ergonomic workplaces and optometric corrections are important elements in the current intervention study.

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 [23, 24].

2. METHODS AND PROCEDURES
Questionnaires dealt with headache, visual conditions and discomfort as well as musculoskeletal pain, organizational and psychosocial factors were implemented by the participants. 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). [25, 26]. A detailed description of the questionnaires and procedures of measuring lighting variables as well as musculoskeletal and optometric parameters are given in the references [27, 28].

Postural load and postural angles: Muscle load was measured by EMG from musculus trapezius and musculus infraspinatus [29]. Dual inclinometers were used to measure postural angles of the head, upper right arm and back [30].
3. RESULTS
The first prospective epidemiological study showed that visual discomfort had a relationship with pain intensity in the neck and shoulder (0.30 < r < 0.40). Table 1. In the second study, visual discomfort was related to neck pain, r=0.40, p=0.0003; regression coefficient 0.37 with CI of 0.18-0.57. The third study 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). The fourth study showed a significant correlation between visual discomfort and neck pain (r=0.44, p=0.038).

Table 1. Correlation (r) between Visual discomfort and body pain.

<table>
<thead>
<tr>
<th>First study (N=150)</th>
<th>Second study (N=90)</th>
<th>Third study (N=34)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body area</td>
<td>r-value</td>
<td>Body area</td>
</tr>
<tr>
<td>Neck</td>
<td>0.30 &lt; p &lt; 0.40</td>
<td>Neck</td>
</tr>
<tr>
<td>Shoulder</td>
<td>0.30 &lt; p &lt; 0.40</td>
<td>Headache</td>
</tr>
<tr>
<td>Forearm</td>
<td>r=0.35, p=0.04</td>
<td></td>
</tr>
</tbody>
</table>

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 studies, visual discomfort explained 53% of the variance of the neck and shoulder pain in VDU workers.

5. References


