A method for assessing risks within visual ergonomics

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1. Introduction

Insufficient visual ability can lead to strained work load for employees and can contribute to eyestrain and musculoskeletal discomfort, "the eye leads the body" (Anshel, 2005). An optimal visual environment provides physical conditions for work in the best possible way. Visually demanding work, such as computer work, is associated with eye discomfort, headaches and muscle pains in mainly the neck and shoulders (Rosenfield, 2011). For computer workers in North America studies show that 75-90 % of the workers reported subjective symptoms from the eyes (Anshel, 2005). The causality between eyestrain and musculoskeletal discomfort is not fully understood, but studies have shown that straining the eyes increases the musculoskeletal activity in neck and shoulders (trapezius), and a link between visually demanding work, eye problems, headache and/or muscle problems have been found (Aarås et al., 2001; Richter et al., 2008; Zetterlund et al., 2009; Zetterberg et al., 2013). A study of call-center workers in Sweden showed that 21% of workers have both eyes and neck problems (Wiholm et al., 2007). Ergonomic problems also exist for professions where computer work is not dominant. Surgeons and other surgical personnel, with subjective eye discomfort, reported twice the incidence of musculoskeletal disorders when compared with staff without eye symptoms (Hemphälä et al., 2011). In an intervention study among postmen the eyestrain and musculoskeletal discomfort decreased after visual ergonomic interventions including customized eyeglasses and optimal lighting conditions (Hemphälä et al., 2012). Apart from health and well-being being affected by a poor visual ergonomic work environment, the quality and productivity are also involved (Eklund, 2009).

Lighting is an important factor; both the lighting quantity (strength) and quality (e.g. light distribution, direction, glare and contrast). Too low illumination makes it difficult to see clearly and may thus lower performance, high illuminance can cause glare and lead to increased eye fatigue and decreased productivity (IESNA, 2011).

2. Methods

There are several factors to consider when developing a method for visual ergonomics risk assessment of subjective symptoms and discomfort of the eyes (Colon et al. 1999; Børsting et al., 2008, Knave et al., 1985). There are also checklists used in eye exams or

medical appointments (Sheedy and Shaw-McMinn, 2002; Wilson & Corlett, 2005). These will be used as basis in the presents the project intended to develop a risk assessment instrument for visual ergonomics.

3. Results

A preliminary version of a risk analysis method for Visual Ergonomics has been developed and will be presented, with a focus on discussing with the audience which factors should primarily be included. The factors included so far in the method are the objective measurements such as illuminance, luminance contrast, uniformity values, expert assessment of the risk for glare; indirect measurements such as subjective ratings of the visual ability, eyestrain and musculoskeletal discomfort. The goal is to develop a practical time efficient method that is easy to use. With such a tool, actions needed to reduce the visual load among the workers, the companies and the society's negative consequences induced by work-related eyestrain and musculoskeletal discomfort can hopefully be identified.

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