

Poster

Luminance Environments and their Impact on Performance, Fatigue and Preferences

C. Hubschneider¹, J. de Boer², A. Steidle¹, L. Werth³, & K. Sedlbauer^{1,2}

¹ *University of Stuttgart, Stuttgart, Germany*

² *Fraunhofer Institute for Building Physics IBP, Stuttgart, Germany*

³ *Chemnitz University of Technology, Chemnitz, Germany*

Introduction

During the last decades, office lighting has changed profoundly. Today, displays are a central component of work space which is characterized as an additional component of the luminance environment. According to Loe, Mansfield and Rowlands (1994) the relevant part of the field of view for the room assessment consists of different areas. In a simplified model, we can identify the screen, the working desk, the background behind the screen and the window as relevant areas in office rooms. The aim of the current study was to investigate the combined influence of all these areas on human performance, fatigue and preferences.

Study design

Sixteen subjects (aged from 17 to 28) participated in the study. Six different lighting scenarios were simulated in a laboratory by using either an artificial window to simulate daylight or the artificial lighting. The scenarios differed in the horizontal illuminance on the working desk and in the luminance on the wall. Horizontal illuminances from 300lx to 1000lx and wall luminances from 50cd/m² to 220cd/m² were presented to the subjects.

Additionally three different monitor luminances were used: 90cd/m², 140cd/m² and 190cd/m². The three different monitor settings were presented in the six different lighting situations. Taken together, the subjects passed eighteen different luminance environments with different levels and ratios of brightness.

According to Boyce (2004) there are three routes by which lighting influences the

human performance: the visual system, the circadian system and the perceptual system.

In order to measure the visual component of the human performance, two visual tasks were selected:

- numerical verification task
- transient adaption task

Furthermore the circadian route was considered. To investigate the influences of the lighting situations on this route, three measurements were chosen:

- Fatigue
- Alertness
- Concentration-performance test

The perceptual system as the third route was measured by:

- Mood
- Room perception
- Preferences

Analyzing the results

The results are currently analyzed in order to demonstrate how different luminance environments influence the participants' performance, fatigue and preferences. For example there should be different preferences for the monitor luminance depending on the lighting scenario and different degrees of fatigue depending on the luminance ratios in the field of view.

The current research will thus contribute to the following issues: Does the luminance environment or the luminance ratio in the field of view influence the subjects' performance, fatigue and preferences? These findings should be relevant for the formulation of future lighting standards and the creation of lighting control systems

Parts of the analysis of the results will be presented in the poster.