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# External validations of a non-obtrusive practical method to measure personal lighting conditions in offices

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## Abstract

Health symptoms may be influenced, supported, or even controlled via a lighting control system which includes personal lighting conditions and personal factors (health characteristics). In order to be effective, this lighting control system requires both continuous information on the lighting and health conditions at the individual level. A new practical method to determine these continuous personal lighting conditions has been developed: location-bound estimations (LBE). This method was validated in the field in two case studies; comparisons were made between the LBE and location-bound measurements (LBM) in case study 1 and between the LBE and person-bound measurements (PBM) in case study 2. Overall, the relative deviation between the LBE and LBM was less than 15%, whereas the relative deviation between the LBE and PBM was 32.9% in the best-case situation. The relative deviation depends on inaccuracies in both methods (i.e., LBE and PBM) and needs further research. Adding more input parameters to the predictive model (LBE) will improve the accuracy of the LBE. The proposed first approach of the LBE is not without limitations; however, it is expected that this practical method will be a pragmatic approach of inserting personal lighting conditions into lighting control systems.

## Keywords

Office lighting; Methodology; Measurements; Case study; Validations; Health

## 1. Introduction

One of the immediate effects of light exposure to the human eye is an increase in alertness (i.e., indirectly via the circadian melatonin suppression or directly as an acute effect) [1]. Researchers have studied the influence of light on human alertness often in the context of office lighting [2]. However, the majority of these light effect studies assessed the effect to average or incidental lighting measurements. Since human health is individualized, the (micro)environment around these individuals should be analyzed independently as well. Several environmental conditions (e.g., air

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