

# Indoor environmental aspects and user perception within an office landscape

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# **Indoor environmental aspects and user perception within an office landscape: an exploratory study in the Netherlands**

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## **SUMMARY**

Workplaces are transforming from office rooms to office landscapes. Previous research about indoor environmental (IE) aspects and health, investigated work-related health issues mostly in conventional office spaces. It is still uncertain which physical aspects in office landscapes might influence employees' health the most. An exploratory study, in a mix method design, including IE measurements and user perception about the indoor environmental quality (IEQ) of the office landscape is performed. Objective IE data showed a discrepancy with how office users experienced the IEQ; therefore, both the Dutch Building Code and user perception need to be considered.

## **PRACTICAL IMPLICATIONS**

This study indicates that current recommended target values for the IE need to be considered in combination with user perception in order to create a healthy office environment.

## **KEYWORDS**

Office landscape, building related health issues, indoor environment, user perception

## **1 INTRODUCTION**

During the last decade, a new alternative working principle has been developed and applied in some offices. This principle includes flexible working hours and a shift towards more collaborative work instead of individual work. Companies increasingly support this working practice in order to improve employees' productivity at work. The layout of office buildings has evolved from rooms to landscapes. Most research investigating work-related health issues focussed on conventional office spaces; however, the new working principle may lead to new or other health complaints.

Work-related health issues can be: psychological disorders (e.g. work stress highlighted by Thayer et al. (2010)); musculoskeletal issues investigated by Helland et al. (2011); or symptoms of the sick building syndrome (e.g. insomnia, visual fatigue and, dry eyes). These health issues can be related to personal, environmental, or social causes. This study focuses on the environmental causes within an office environment. Indoor environmental aspects that potentially affect employees' health are building design, ergonomics, or physical aspects like lighting, acoustics, thermal climate, and privacy space within the work environment. Because office landscapes are a relatively new concept, it is still uncertain which IE aspect contributes to improvements regarding employees' (perceived) health.

An exploratory case study in an office landscape environment investigated user perception about the office IE and evaluated these in combination with IE measurement data.

## 2 MATERIALS/METHODS

IE data was collected for a period of five days in January 2016. Temperature, relative humidity and horizontal illuminance were measured at desk level at four different locations within the office environment. This data was accompanied by employees' perception regarding their work environment collected during not-scheduled open non-structured interviews.

## 3 RESULTS

The majority of the IE measurements indicated acceptable environmental conditions, according the recommendations in the Dutch Building Code (NEN-EN-ISO 7730). The temperature and relative humidity exceeded the upper limit for a maximum of 9.8% of the time during working hours. However, the average illuminance recommendations (NEN-EN 12464-1) were not implemented correctly. Three of the four locations met the criteria for respectively 7.5%, 28%, and 29% of the working days within the measurement period.

In addition to the measurements, twenty-two employees took the opportunity to express their opinion about the indoor climate. In contradiction to the measurements, the majority reported negatively regarding temperature and relative humidity. The perception of lighting conditions varied but was overall neutral to positive. Besides the temperature and relative humidity, employees reported high noise levels and varying ventilation rates.

## 4 DISCUSSION

The objective and subjective data collected in this study demonstrated a largely contradicting result. The contradiction between subjective and objective measures also occurred for the lighting conditions, but in a reversed way.

Whereas the boundaries for thermal comfort are narrow, the human eye can adapt within a wide range of luminances, from 0.0001 cd/m<sup>2</sup> to 20,000 cd/m<sup>2</sup> (Boyce, 2014). The capacity of the eye to adapt does not mean that constantly adapting is experienced as comfortable. Adaptations may, for example, lead to eyestrain or visual fatigue.

## 5 CONCLUSIONS

It can be concluded that in this single case study, evaluation of the IE measures only will give a misleading result. The recommendations for IE according the Dutch Building Code are determined to create safety. In order to create a healthy environment and not only a safe environment, human comfort needs to be added to the set of recommendations.

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