

# Indoor Environmental Quality in Home Offices: A Proof-of-Concept Study on Pleasure and Discomfort

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## ABSTRACT

**Introduction.** Remote work has become increasingly common. Hence, it is critical to understand better the prevailing indoor environmental quality, including the domains of thermal, visual, acoustic, and air quality, and their influence on well-being in work-from-home environments. Further, limited research has explored how these factors interact with subjective perceptions of pleasure and discomfort and physiological stress indicators like heart rate variability and blood pressure.

**Method.** This study employed a mixed-methods approach, combining objective environmental measurements with subjective diary entries and physiological monitoring. Fourteen participants, working from home, were asked to document their pleasure or discomfort through diary entries over 3.5 days each. Environmental sensors were used to continuously record data on temperature, humidity, CO<sub>2</sub> levels, sound pressure level, and light. Simultaneously, physiological metrics such as heart rate and blood pressure were tracked. Mixed-effects models were employed to analyse the relationship between environmental conditions and both subjective and physiological responses, accounting for individual variability.

**Results.** The findings reveal that lower temperatures and high humidity were strongly associated with discomfort, while higher CO<sub>2</sub> levels and noise were linked to increased physiological stress, as reflected by lower heart rate variability and higher blood pressure. Specifically, participants reported thermal discomfort most frequently, with temperature and humidity significantly correlated with both subjective comfort and heart rate variability. Reports of visual and acoustic discomfort were less frequent but still noteworthy, especially under conditions of poor lighting and high sound levels. In contrast, moments of pleasure were reported very few times, primarily linked to favourable environmental conditions, such as sunlight, fresh air, or enjoyable acoustic experiences, underscoring the potential for optimised indoor environments to enhance well-being. Notably, multi-domain discomfort was correlated with higher stress levels. These findings align with the concept of sensory boredom, which suggests that contemporary built environments hardly offer relevant stimuli for human sensory system.

**Discussion.** The results highlight the complex interplay between indoor environmental quality factors and stress responses in home offices. Poor indoor environmental quality, especially concerning temperature and CO<sub>2</sub> levels, significantly influences both comfort and physiological markers of stress. These findings suggest that optimising environmental conditions in working from home setups is crucial for enhancing comfort and reducing stress, which, in turn, can promote well-being. Future research should explore more longitudinal data to assess long-term health outcomes associated with chronic exposure to poor home office environments.

## KEYWORDS

Remote work stress; well-being; occupational health; multi-domain comfort