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The need for occupant-related and building-related indicators in our guidelines for indoor environmental quality

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Extended abstract. Research has shown that, even though the indoor environmental conditions seem to comply with current guidelines and those conditions seem ‘comfortable’ enough, staying indoors is not good for our health. Reasons for this discrepancy might be the fact that these guidelines are based on single-dose response relationships to prevent negative effects, and that the criteria are determined for an average adult person, ignoring interactions occurring between stressors at human as well as environmental level. The fact that we are dealing with individuals in different scenarios (e.g. homes, offices, schools) and situations (e.g. sitting behind a desk, listening to the teacher, cooking, sleeping,) is ignored.

Background. We are confronted with diseases and disorders related to indoor environmental quality (IEQ) such as mental illnesses, obesity and illnesses that take longer to manifest, among which cardiovascular and chronic respiratory diseases and cancer, and very recently, COVID-19, caused by mainly airborne transmission of SARS-CoV-2 indoors. Except for these health effects, the consequences for indoor environment of climate change, the effects of the retrofitting measures we take to reduce energy consumption on health and comfort indoors, is also an emerging concern. The question therefore arises, how can we ensure a healthy and comfortable indoor environment during pandemic and non-pandemic times? IEQ is determined by four IEQ-factors, which are interrelated: air quality, lighting quality, acoustical quality and thermal quality. The health and comfort indicators that are available to assess IEQ are: the dose-related indicators, the occupant-related indicators and the building-related indicators. Recently, a new model that includes all stressors (physical, physiological, personal, psychological and social), integrated effects, both positive and negative, and interactions at indoor environmental and human level, and accounts for preferences and needs of the individual, was introduced and validated (Figure 1) (Bluysen 2019; Bluysen 2022). This integrated model forms the basis for defining the occupant, building and dose-related indicators needed to create and maintain healthy and comfortable indoor spaces for different occupants in different situations.

Aims. To determine which indicators are potentially interesting for use to assess IEQ as well as gaps in knowledge.

Methods. Extensive literature reviews were performed, focussing on different standards and guidelines applied in different countries and worldwide research performed on IEQ in dwellings, schools, offices, hospitals and sport facilities (Bluysen 2014; Eijkelenboom & Bluysen 2019; Ortiz et al. 2020; Zhang et al. 2022; Hobeika et al. 2023).

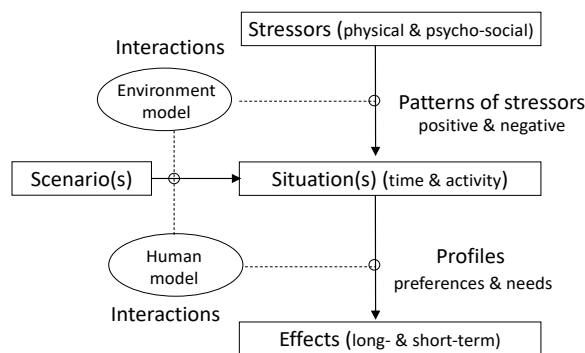
Results. The outcome of the literature reviews shows that most current standards and previous investigations on IEQ mainly focused on dose-related indicators (such as ventilation rate and temperature), while building-related indicators (such as ventilation regime) and occupant-related indicators (such as IEQ preferences) have been rarely considered. Moreover, in general, standards and guidelines only focus on one IEQ factor, especially on IAQ (e.g. ventilation rate). Few studies including interactions between the different IEQ-factors (at environment or at human level) have been undertaken.

Conclusions. The literature review studies show that occupant-related indicators (such as

preferences and needs, activity level, health status) and building-related indicators (such as characteristics of a building and its components and certain measures taken) should be considered in standards and guidelines. Identification of preferences and needs (profiles) of different occupants for different scenarios and situations is needed, as well as building-related indicators to realize the required environmental conditions (dose-related indicators) for each profile. Cross-modal effects between the IEQ-factors, both at environment and human level, are suggested to be considered for future standards development.

Keywords. Indoor environmental quality, standards and guidelines, health and comfort, indicators.

Figure 1 Integrated research model (Bluyssen 2019).



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