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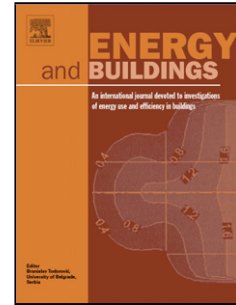
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# Thermal adaptation in overheated residential buildings in severe cold area in China

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## Abstract

The winter in the severe cold area of China is long and cold. The mean outdoor temperature is about  $-10.0^{\circ}\text{C}$  during the winter in Harbin, while the indoor air temperature is often above  $24^{\circ}\text{C}$ . How does the indoor environment influence human thermal comfort and adaptation in such an overheated environment?

A combined approach of spot-reading measurements and occupant interviews was adopted in nine residential buildings of five communities during the heating period in 2013-2014. Twenty residents were chosen as respondents. Totally 308 valid questionnaires were collected. The heating periods were separated into three phases based on the outdoor temperature.

The results show that the mean indoor air temperatures in the early-, mid- and late-heating periods were  $23.6^{\circ}\text{C}$ ,  $24.3^{\circ}\text{C}$  and  $25.0^{\circ}\text{C}$ , respectively, which were larger than or close to the upper limit recommended by thermal comfort standards, and slightly higher than the related thermal neutral temperatures. With the heating process, the mean clothing insulation of residents decreased. Opening windows and reducing clothing were mainly taken by the residents to adapt to the overheated environment.

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