



International High- Performance Built Environment Conference – A Sustainable Built Environment Conference 2016 Series (SBE16), iHBE 2016

Thermal environment and thermal sensations of occupants of nursing homes: a field study

Federico Tartarini^{a,*}, Paul Cooper^a, Richard Fleming^a

^aUniversity of Wollongong, Northfields Ave, Wollongong NSW, 2522, Australia

Abstract

A demographic shift is underway in Australia; the number of people aged 65 and over is rapidly increasing. Regulations have been implemented to enhance the quality of care being provided in nursing homes; however, in the aged care sector there is little by way of guidance addressing design and performance issues in regards to Indoor Environmental Quality (IEQ), and there is still uncertainty as to the perceptions of residents on specific IEQ factors. The objectives of this study are to determine: how accredited facilities are performing in regards to thermal comfort conditions; how indoor environmental factors can be assessed in a non-intrusive way; and how occupants perceive their thermal environment. Air temperature and relative humidity were monitored over ten months in six nursing homes located in southeast NSW using 305 loggers. Subjective perception of the thermal environment was gathered from 157 residents, 31 family members and 64 staff who completed a questionnaire at the same time that local environmental parameters were monitored. Results show how accredited nursing homes performed in regards to thermal comfort, along with a detailed description of the non-intrusive methodology adopted to assess IEQ factors. Subjective responses of occupants, along with adaptive behaviour strategies employed by participants to counter unsatisfactory thermal conditions, were also examined. This study has practical implications for the aged care sector and provides quantitative evidence on how nursing homes should be designed and operated to enhance satisfaction and well-being of occupants.

© 2017 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Peer-review under responsibility of the organizing committee iHBE 2016

Keywords: thermal comfort; residential aged care facility; older people; field survey; IEQ monitoring device

* Federico Tartarini. Tel.: +61-4-239-2109.
E-mail address: ft674@uowmail.edu.au

1. Introduction

Australian population is ageing, in 2015, about 15% of the total population was aged 65 years and over [4] and this age group is projected to increase to 22% in 2061 [3]. Due to this demographic shift, the demand for aged care services is also projected to grow in the coming years and new facilities will need to be built. In 2014, approximately 270,600 people resided in Australian nursing homes [8]; and the aged care sector consumed around 7.8 million gigajoules of energy [27]. A report from the NSW Office of Environment and Heritage showed that on average heating and cooling systems accounted for 30% of the whole energy consumption in nursing homes, and 15% of the total electricity and 18% of the total gas consumption could be saved by implementing energy efficient solutions [27]. Inefficiencies in heating and cooling systems, especially when caused by malfunctioning and misuse of control systems, and poor building fabric not only increase energy bills but also have an impact on thermal comfort.

Evidence from nursing literature studies indicates that Indoor Environmental Quality (IEQ) not only plays a central role in providing comfort but could also be seen as a non-pharmacological method to reduce the occurrence of unwanted behaviours and to enhance the well-being of occupants of nursing homes [18]. Therefore, several 'design guides' have been published to help architects, building designers and care providers to better understand how to improve interior design (e.g. safety, mobility) of facilities [10]. However, in the literature regarding nursing homes there is very limited guidance on how facilities should be designed/operated to enhance thermal comfort [18]. Uncertainty still remains about perceptions of residents on specific IEQ factors (e.g. lighting, noise and thermal comfort) [19,21], and the specific impact that thermal environment may have on quality of life of occupants has not been fully understood [17,30,32]. Evidence from architectural and engineering studies has shown that the thermal environment has a central role in enhancing productivity and well-being of building occupants [11,14,17]. However, to date, only a limited number of field studies have been conducted in nursing homes [18]. Nursing homes represent something of a hybrid category of buildings: part residential, part offices and part commercial [30]; and different types of occupants (e.g. staff versus residents), who might have different thermal requirements due to variations in types of activity, clothing insulation, time spent indoors and health status, share the same environment.

The most commonly used general purpose thermal comfort standards, ASHRAE Standard 55 [1] and ISO 7730:2005 [24], do provide comprehensive/quantitative guidance as to thermal sensation as a function of age; in other words, the neutral temperature is taken to be constant among different age groups. This assumption is based on Fanger's findings, since he observed that healthy people aged around 65 years and college-age subjects showed no significant difference in their preferred temperature [12]. Fanger argued that older adults have a lower basal metabolic rate (approximately 4 kcal/m²hr) than college-age subjects; however, the decrement of metabolic rate is compensated by the decrement of insensible perspiration [12]. In June 2012, the median age of Australian nursing homes residents was 86 years old [7]. Arguably, a person aged 86 may have a different thermal comfort sensation than a person aged 65 [33].

Over the past fifty years, several studies have been conducted on older adults to determine whether age affects thermal sensation; however, some found quantitative evidence to support to Fanger's model, while others have found differences in the subjective perception of thermal environment between older and younger adults [21,33]. Therefore, uncertainty remains and, as a result, little by way of guidance exists to help the aged care sector in understanding how to design and operate heating ventilation and air conditioning systems in nursing homes. Furthermore, about 50% of permanent residents of nursing homes have dementia [6]. Dementia may alter how people, affected by this pathology, perceive the environment and their thermoregulation [18]. Until specific guidelines are provided, caregivers are likely to continue to attempt to modify the indoor environment relying on trial and error adjustments [18] and facilities that may not offer optimal thermal conditions for occupants may continue to be built. Extended exposure to hot and cold temperatures may not only cause a sensation of thermal discomfort but may also have repercussions on health, well-being and manifestation of unwanted behaviours (e.g. agitation) [17,19,30]. More research is needed to investigate thermal sensation of people aged 65 years and over living in nursing homes [17,21].

Along with inconsistent views on how age influences perceptions of thermal comfort, we found little in the literature on how IEQ factors could be assessed in a non-intrusive way in care centres. A wide range of sensors and logging devices are currently available; however, to the authors' knowledge, only a limited range of portable equipment can be used to monitor IEQ factors in accordance with the requirements of the thermal comfort standards.

Download English Version:

<https://daneshyari.com/en/article/5028941>

Download Persian Version:

<https://daneshyari.com/article/5028941>

[Daneshyari.com](https://daneshyari.com)