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Embodied thermal environments: an examination of older-people's sensory experiences in a variety of residential types

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HIGHLIGHTS

- Some thermal technologies present particular sensory issues and problems for older people.
- Older people use a range of sensory stimuli in evaluating and controlling thermal environments.
- Older people use non-thermal sensory information when selecting between thermal technologies.
- Sensory information plays an important role in thermal technology maintenance.

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ABSTRACT

Thermal sensations of space, namely temperature, humidity and the movement of air, can be difficult to separate from other sensory information such as the sound of fans or ventilation equipment, or the smell of damp or cool fresh air. Despite this factor, efforts to reduce the consumption of energy through the installation of low-carbon technologies including sealed whole-building systems frequently isolate the thermal environment and fail to recognise and respond to the influence of other sensory information on personal preferences and behaviours. Older people represent an increasing proportion of the UK's population, can be faced with a range of physiological challenges associated with ageing, and sometimes have long-established personal preferences. Drawing from data collected across the Conditioning Demand Project, this paper explores the embodied nature of older people's experiences of low-carbon and more traditional thermal technologies in private residences, extra-care housing and residential care-homes, focussing specifically upon auditory and olfactory stimulus. Exploring the management of the sensory experience across these settings, we analyse each case to inform the development of new design and policy approaches to tackling housing for older people. In doing so, we further build connections between energy research and debates around sensory urbanism.

1. Introduction

The consumption of the world's natural resources, and in particular the burning of fossil fuels and related release of potentially harmful gases into the air, has moved increasingly into the international political arena, underpinned by concerns regarding environmental degradation and more recently, climate change. In the United Kingdom (UK) in 2011 26% of all energy consumed was used in the heating and cooling of domestic residences (DECC, 2012), and as a result has provided a key governmental focus for investment in the development of new low-carbon thermal technologies, housing typologies and suggested ways of living.

At the same time, like many western nations, the UK has an increasingly ageing population and this is accompanied with concern on how future generations might best meet the related burden of cost to national health and welfare budgets. Consequently, the provision of different residential typologies and care models for older people has emerged as an important issue (Pannell et al., 2012). Older people, and in using this term we refer to people ranging from approximately 60 years upwards, vary significantly in their activity levels, mobility and care requirements (Hitchings and Day, 2011). Although some older people will remain in the same residence as they have lived throughout their adult life well into or for the entirety of their old age, the majority will move into other types of accommodation whether as a result of economic necessity, reduced requirement for space, or physiological and/or other care requirements. These residential types can vary significantly in their age, typology and technologies, and in

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the level of control and autonomy afforded to the older people who reside within them. When considering the particular challenges presented by ageing bodies, an approach which puts the older user at the heart of the design of residential environments seems a key policy goal. To illustrate, the 1998 UK general household survey found for example that 53% of men and 41% of women aged 75 years or over reported some difficulty with their hearing (Bridgwood, 2000) and 50% of people exhibit major loss in olfactory function over the age of 65 (Kivity et al., 2009, p, 241). Furthermore, some ageing related neuropsychiatric diseases such as Alzheimer's disease and Parkinson's disease have a direct influence upon olfactory performance (Schiffman et al., 2002).

Architectural design has always played a powerful role in shaping our thermal experiences of indoor experiences. In their crudest form, primitive structures provide some shelter from the elements in the form of a barrier to the movement of wind and cover from falling rain or snow. At the opposite end of the scale, contemporary buildings can provide sealed and controlled environments with a pre-set constant temperature and level of air-movement. As we have written elsewhere;

'… buildings do keep hostile elements at bay, and they do allow people to live and work in otherwise uninhabitable parts of the world. More than that, they can be designed to provide a stable, confortable and utterly predictable indoor climate. However, contentment with technologies of shelter has become increasingly tempered by anxiety about their effects on our health and welfare and by knowledge of their contribution to global warming' (Guy, 2009, p. 220–221).

In theory at least, technological advancement has produced a range of tools, some more environmentally friendly than others, that are available to architectural and building professions making it possible to design and deliver thermal environments to a prescribed specification. The focus of design attention therefore shifts towards determining the optimal temperature, or range of temperatures, at which an environment might operate.

In this paper, we draw from across the findings of the Conditioning Demand Project funded by the UK's Engineering and Physical Sciences Research Council (EPSRC) and Energy Supplier EDF, investigating older-people's thermal experiences of different residential types (private housing, extra-care housing and residential care homes), and using a wide range of thermal technologies including low carbon and more traditional systems.

We do so with a specific focus upon the inter-sensory nature of thermal experience, and in particular through the examination of auditory and olfactory information in older people's everyday experiences of thermal technologies, and their related perceptions and behaviours within the home. We argue that in gaining a better understanding of older people's embodied thermal experience and related practices, architects, policy makers, housing and care providers, and technologists are better placed to respond appropriately, effectively and sympathetically to the thermal requirements of older people, and the significant related energy challenges faced. In doing so, we build connections between energy research and debates around sensory urbanism (Guy, 2007).

2. Thermal comfort, sensory delight and older people

"It is not just the urban setting in which we live that change with the passing of time: our own perceptions, sensitivities, and ways of living as well as our sensory thresholds and levels of tolerance or appreciation of odours, sounds, dirt, darkness, cold, or heat tend to vary" (Zardini, 2006, p. 22).

Just as wider groups of people have different thermal preferences, older people too are highly influenced by factors other than those determined by age in establishing their own preferred optimum thermal conditions. Yet, it is also important to acknowledge that as people age they are increasingly likely to face particular challenges which can influence their thermal experiences and requirements of their residential accommodation. For example, older people find it more difficult to quickly detect and respond to changes in temperature as part of their normal physiological processes such as shivering (Stocks et al., 2004) or sweating (Havenith, 2001), and are also likely to experience difficulties in reaching or stretching up or down to high or low cupboards or windows (Duncan et al., 1990). Older people are more likely to struggle with their fine motor skills, impacting upon their ability to manipulate small switches, and are also likely to suffer from other sensory losses including those relating to vision (Horowitz and Mould, 1997), hearing (Bridgwood, 2000) and in their sense of smell (Kivity et al., 2009; Stevens et al., 1984) which also impacts upon their sense of taste (Mojet et al., 2001) given the inter-related nature of these latter two senses. As a living organism, the older human body is without doubt less efficient in quickly extracting sensory information from, and reacting to, sensory stimulation when compared to younger bodies, and the same is true of the mental processing of sensory information which also slows as the body ages (Tilvis et al., 2004). However, this does not mean that sensory information is less important or less useful to older people, nor suggests that older people are less able to gain enjoyment, stimulation or meaning from sensory information; rather it indicates that older bodies have to work harder to do so.

The idea of thermal comfort represents a state which might be considered as the direct opposite to thermal annoyance; one where the body is comfortable and at ease, exposed to a steady temperature, level of humidity and air movement thus preventing any perceived under or overheating within an individual. What is missing in this comparison is scope for the idea that sensory experiences of space might provide more positive hedonic value for their inhabitants. Within the context of considerations of thermal characteristics of space, these might manifest in the form of thermal pleasure or even delight such as the feel of the extreme heat of a fire on a cold day, or the cool floor underfoot. This issue is not only limited to thermal characteristics of environments but can equally be applied other sensory environmental characteristics such as auditory comfort as opposed to noise annoyance, and olfactory comfort as opposed to odour annoyance. Thibaud (2010) highlights how attempts are made as a result to measure and standardise many sensory characteristics of space to a point where they can best meet the imagined requirements of an end-user group. The idea of thermal comfort from this perspective is thus placed within a reductionist view of the senses, one which limits some of the opportunities which might otherwise be presented by a more sensory aware and contextually flexible approach to architectural design.

This is not a new critique. In a book published originally in the late 1970s, architect Lisa Heschong succinctly tracks the increasing ability of humans to exercise control over the thermal characteristics of surrounding environments. She outlines the impact first of fire and clothing in offering protection from the elements and the use of basic dwellings in providing shelter from inclement weather and creating spaces with their own distinct micro-climates. Later, she observes the development and use of sophisticated heating systems capable of moving heat around complex multi-roomed structures. Finally, the development of air cooling systems providing relief in warmer climates, enabling humans to reside in hot arid areas without having to experience the discomfort of otherwise inescapable high temperatures. Hershong, (1979) argues that accompanying these technological advances has emerged a notion of a thermal optimum. 'There is an underlying assumption that the best thermal environment never needs to be noticed and that once