Designing for an imagined user: Provision for thermal comfort in energy-efficient extra-care housing

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HIGHLIGHTS

- Explores the factors that condition energy demand in older people’s housing.
- Considers how user representations are scripted into building design.
- Older occupants characterised as vulnerable to cold and having low incomes.
- These user representations affect selection of thermal technologies.
- Priority given to keeping occupants warm, leading to possible risk of overheating.

ABSTRACT

Regarded as one solution to the problem of how to enable older people to retain their independence, extra-care housing, where each resident has their own self-contained dwelling and access to communal facilities and to care, has received extensive funding in recent years. Implicit in the concept of specialist housing is the notion of ‘special’ occupants, imagined older people. Adopting a socio-technical approach, this paper considers how ideas about ageing inform those aspects of extra-care-housing-design that relate to thermal comfort. The paper draws on semi-structured interviews with 13 people involved in the design, development and management of UK-based extra-care housing. Participants characterised imagined occupants as vulnerable to cold, at risk from fuel poverty and liable to be burned by hot surfaces or fall from high windows. These user representations were reportedly inscribed into the design of extra-care housing schemes through the inclusion of building features such as communal heating, under-floor heating, restricted window opening and heated corridors. The utilisation of stereotypical user representations of older people raises questions, given that older people’s thermal comfort needs can be highly diverse. The paper explores the implications for energy demand.

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1. Introduction

1.1. The need to reduce energy consumption for domestic heating

Approximately 46% of the energy consumed in the UK is used to provide heat. Of this energy, roughly 75% is used in domestic, commercial and public buildings (DECC, 2012). For the UK Government to achieve its stated aim of virtually eliminating carbon emissions from buildings by 2050 (DECC, 2011), it will be necessary to drastically reduce the amount of energy consumed in heating buildings, including in domestic heating.

Specialist housing, designed specifically for the typical needs of older people, is interesting in this context as the older population is often characterised as being particularly vulnerable to the cold.

1.2. Older people and domestic heating

In striving to understand how energy demand is conditioned by the perceived needs of an ageing population, it is necessary to consider how age and ageing are constructed conceptually. Perhaps the most simplistic understanding of age is chronological; the
number of years a person has lived. Some writers are critical of “chronological age,” observing that two people of the same age might have markedly different physical and cognitive capacities. The term “biological age” has been used to denote a person’s physical state, resulting from the ageing process (Phillips et al., 2010). A person’s biological age can be affected by inherited (genetic) and environmental (lifestyle or pollution-related) factors (Coupland, 2009). Further distinctions can be made between chronological age and social ageing, that is, cultural expectations of age and ageing. To this extent, understandings of age and ageing are constructed through social and cultural institutions and have evolved through different historical periods (Phillips, 2013).

In the UK, policy debates around older people’s winter warmth centre on the biological dimension of ageing, particularly the notion that physiological changes and poor underlying health can cause older people to be vulnerable to the cold; and on the institutional dimension, particularly the view that as many older people are retired they can experience difficulties in paying energy bills owing to low income (Day and Hitchings, 2011).

Physiological studies have shown that older people can experience diminished capability in maintaining stable core temperature; reduced vasoconstriction response to thermal stress means the aged body is often less effective at diverting blood away from the skin to prevent heat loss when exposed to cold temperatures. In addition, reduced skeletal muscle mass leads to a lower metabolic rate meaning that less heat is generated within the body and the threshold at which shivering is induced is lowered (Stocks et al., 2004; DeGroot and Kenney, 2007; Florez-Duquet and McDonald, 1998).

The adverse effects to health of living in cold environments are believed to contribute to the approximate 27,000 excess winter deaths that occur in the UK each year (Hills, 2011). Approximately 40% of these are attributable to cardiovascular deaths, and around 33% to respiratory problems (Public Health England, 2013a; World Health Organisation, 2011). Older people are regarded as particularly vulnerable (Hills, 2011), particularly if they suffer from underlying health conditions such as heart or respiratory diseases (Public Health England, 2013ab; Department of Health, 2010; Marmot Review Team, 2011).

Retirees’ relatively low income compared to the rest of the population is seen as a factor in preventing many older people from being able to adequately heat their homes (Day and Hitchings, 2009). While the phenomenon of fuel poverty is not a problem exclusive to the older population, older people’s vulnerability to cold conditions, and the likelihood that they will spend more time at home than working people (Adams and White, 2006), has led to interventions targeted at retirees. These including winter fuel payments, distributed to those receiving State Pensions (Walker and Day, 2012).

A dwelling’s energy performance is a major factor in determining how much a household needs to spend in order to attain an adequate standard of heat (Liddell et al., 2012). It has been suggested that those households that are in fuel poverty are also the most likely to live in poor quality housing, with low standards of thermal insulation (Boardman, 2010). Policies introduced in the UK to address this problem include Warm Front (Richardson and Eick, 2008), where grants were made available to those on low income for insulation and upgrades to heating systems. Also, the Decent Homes Standard was introduced in 2000 to ensure all social housing is insulated to specific standards (Walker and Day, 2012).

1.3. Extra-care housing

Under the UK Government’s Housing Strategy, the provision of specialist housing, designed specifically for the typical needs of older people, is proposed as one solution to some of the challenges created by an ageing population. It is argued that suitably designed housing can enable older people to retain their health and independence, reducing and even preventing the need for health and social care. It is also suggested that enabling older people to move into specialist housing will help to free-up much-needed family housing (HM Government, 2011:48).

One particular housing-type that in recent years has been popular with UK policymakers is extra-care housing, which provides occupants with self-contained dwellings, and access to communal facilities and to care where necessary. Although the term “extra-care housing” covers a wide range of provision, broadly the intention is that occupants should be enabled to self-care, with additional care and support tailored to suit individual need. While some occupants have no care needs, some occupants have high care needs to the extent that they might otherwise require long-term residential care, and 24-hour care support is usually available, although this is not necessarily located on-site (Riseborough and Fletcher, 2008). Local authorities usually fund care, although a wide range of tenures is available from social rent through to private leasehold (Head et al., 2013).

The previous Labour Government invested £227million through the Department of Health’s Extra-Care Housing Fund Initiative alone (Darton and Callaghan, 2009). Additional money was invested via the Homes and Communities Agency (HCA), on behalf of the Department of Communities and Local Government, and by not-for-profit housing providers and private developers. The current Coalition Government has pledged to spend a further £300 million on specialist housing, including extra-care housing (Department of Health, 2012; Homes and Communities Agency, 2012).

Housing schemes that receive capital funding from the Homes and Communities Agency or the Department of Health are currently expected to comply with the HCA’s Design and Quality Standards. For general-needs housing to meet these standards it is necessary for buildings to achieve a minimum predicted energy performance rating of Code Level 3 under the Code for Sustainable Homes (Housing Corporation, 2007; Department for Communities and Local Government, 2010). While there is no such requirement for older people’s housing, housing schemes that obtain an environmental rating are more likely to receive public funding (Nicholson et al., 2008). Where a housing scheme’s communal facilities take up more than 10% of the total floor area, then an alternative energy rating, BREEAM, is used. The UK Government plans to scrap the Code for Sustainable Homes in 2015, with energy-efficiency standards incorporated into the Building Regulations (Department for Communities and Local Government, 2014).

Similarly, general-needs social housing schemes that receive public funding are also expected to obtain a specified minimum score under the Housing Quality Indicators (National Affordable Homes Agency, 2008). While these Housing Quality Indicators are not mandatory for older people’s housing, they have a role in establishing the accepted standards for social housing. There are several items in this evaluation tool that affect design for thermal comfort, including the requirement for rooms to have individual thermostats.

In 2009 a report was published, written by the Housing our Ageing Population: Panel for Innovation (HAPPI), which has been very influential in the UK (HAPPI, 2009). The report explored how, in the UK, the standards of older people’s housing could be improved. In the foreword, the Panel’s Chairman, Lord Best, suggested that:

“Without a sufficiently attractive ‘offer’, most of us will stay put in homes that may gradually become harder to manage, maintain and keep warm...” (HAPPI, 2009)
The report makes a number of recommendations for sustainable building design, noting that older people often find it more difficult to regulate their own body temperature, and generally spend more time at home, thus spending more money on heating and cooling (HAPPI, 2009). The report has become an important instrument in evaluating bids to the HCA for capital funding.

1.4. The imagined users

Implicit in the concept of specialist housing is the notion of ‘special’ occupants, imagined older people. Akrich and Latour (1992) have suggested that designers draw on “user representations”, that is, on implicit or explicit images of the anticipated users of a technology or product. Akrich has suggested that designers:

“...are from the very start constantly interested in their future users. They construct many different representations of these users, and objectify these representations in technical choices.”

(Akrich, 1995)

The process by which user representations are inscribed into new products is conceptualised in the notion of the ‘script’. In this process, designers ‘write’ into an object certain scenarios for its use (Neven, 2011) based on assumptions about users’ tastes, competences, motives and aspirations (Akrich, 1992). This process of scripting enables or constrains users, making it easier to use a technology or product in the ways envisaged by the designer. Users are not bound by these scripts, however, and might use an object or device in ways unanticipated by the designer.

Akrich and Latour’s concept has been used in a number of studies exploring how representations of older people are scripted into technologies (Hyysalo, 2006; Mort et al., 2013; Neven, 2010; Peine et al., 2014). These studies focus on healthcare technology rather than on building design, and have mostly centred on technologies designed by a single organisation, where the process of inscription is linear. By contrast, building design involves the selection of pre-existing technologies; although the building of inscription is linear. By contrast, building design involves the technologies designed by a single organisation, where the process rather than on building design, and have mostly centred on technologies designed by a single organisation, where the process of inscription is linear. By contrast, building design involves the selection of pre-existing technologies; although the building of inscription is linear.

2. Aims and methods

This paper considers how user representations of older people are scripted into those aspects of extra-care housing that relate to thermal comfort. The paper will consider how these ‘scripts’ enable and constrain occupants’ energy use in relation to space heating. The possible implications for current and future energy policy will be explored, and pathways for future research identified.

Eight semi-structured interviews were conducted with thirteen people involved in the design and management of energy-efficient extra-care housing schemes. Interviewees included: an architect, an architectural assistant, an architectural technologist, a mechanical and electrical (M+E) engineer, two project managers, a facilities manager, two housing scheme managers, and four development managers working for not-for-profit housing providers (Table 1). One interviewee (no.10) was included in the sample because he authored a guidance document on designing low-carbon older people’s housing. All other participants were recruited because of their involvement in the development, design or management of specific housing schemes that were identified by the researchers as exemplars.

In total four schemes were identified as exemplars owing to the presence of low-carbon heating systems (Table 2). An additional consideration in selecting these housing schemes was to ensure there was variety in the sample in terms of heating technologies and building types. All were social housing schemes, as no private-sector schemes were found with low-carbon heating technologies. Although individuals involved in the design and management of all four housing schemes were invited to participate in the study, those involved in scheme 4 were unwilling to participate. Interviews were also conducted with occupants in housing schemes 2–4, although not in scheme 1 owing to a lack of interest from occupants; the findings of these occupant-interviews will be reported elsewhere.

Questions aimed to elicit ideas about how representations of older people are scripted into building design, with regard to provision for thermal comfort. In particular, participants were asked how housing designed specifically for older people differed from general-needs housing. Interviewees were also asked about management practises as far as they impinge on assumptions about how buildings will be used. The interviews were conducted between November 2011 and January 2013. Interviews lasted between 36 min and 81 min, were recorded using a digital voice recorder and were transcribed verbatim. Transcripts were anonymised to ensure confidentiality and interviewees are identified by code numbers in this paper.

During the analysis process, N-Vivo 9 software was used to store and retrieve data. The initial analysis of data involved the identification of user representations and associated scripts. During this initial stage of analysis, a grounded theory-approach was used (Silverman, 2011), in which attempts were made to identify themes emerging from the interview data. In the second stage of

<table>
<thead>
<tr>
<th>Interviewee no.</th>
<th>Interview no.</th>
<th>Business/profession</th>
<th>Role</th>
<th>Involved in which housing scheme?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 A</td>
<td>Architect</td>
<td>Scheme 1</td>
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<tr>
<td>2 A</td>
<td>Architect</td>
<td>Scheme 2</td>
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<tr>
<td>3 A</td>
<td>Architect</td>
<td>Scheme 1</td>
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<tr>
<td>4 B</td>
<td>Housing provider</td>
<td>Scheme 3</td>
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<td>5 C</td>
<td>Housing provider</td>
<td>Scheme 3</td>
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<td>Housing provider</td>
<td>Scheme 3</td>
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<td>7 D</td>
<td>Housing provider</td>
<td>Scheme 3</td>
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<td>8 D</td>
<td>Housing provider</td>
<td>Scheme 3</td>
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<tr>
<td>9 E</td>
<td>Architect</td>
<td>Scheme 3</td>
<td></td>
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</tr>
<tr>
<td>10 F</td>
<td>Project management</td>
<td>[Author of guidance document]</td>
<td></td>
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</tr>
<tr>
<td>11 G</td>
<td>Housing provider</td>
<td>Scheme 2</td>
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<tr>
<td>12 G</td>
<td>Housing provider</td>
<td>Scheme 2</td>
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<td>13 H</td>
<td>Services engineer</td>
<td>Scheme 2</td>
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</tbody>
</table>
analysis, these themes were mapped onto concepts identified in the existing literature, in order to situate the data. The themes identified correspond with dimensions of age attributed by the interviewees to the imagined users.

3. Results

The presentation of the results is structured around the themes identified in the analysis of data. Each theme reflects a dimension of age attributed to the imagined users by the interviewees.

3.1. Financial dimension

In interviews, four housing providers suggested that one of the main drivers in the creation of energy-efficient buildings was the desire to ensure that occupants of extra-care housing schemes were not in fuel poverty (nos. 4, 6, 7 and 8). This was partly a response to occupants’ anticipated needs. As a housing provider explained:

“It’s the right thing to do, because [CITY NAME] where we are is a critically deprived area and you look at statistics for… people who are spending more than ten percent of their income on heating their homes and we’ve got a lot of people [in] fuel, fuel poverty.” (no. 6, housing provider)

Another housing provider explained that the hope was that by creating an energy-efficient building, heating bills would be low, such that:

“Hopefully… it’s economic to run so [the occupants] can have the heating on as much as they want, you know, whenever they want rather than having to think, should I put the heating on, should I not put the heating on?” (no. 4)

The same interviewee (no. 4) pointed out that the housing provider’s energy bills would also be lower because of the decision to create in energy-efficient building. However, unlike the other housing providers, interviewee no. 4 felt that concerns around occupants’ energy bills were secondary in the decision to create energy-efficient buildings: the primary driver was the desire to secure funding, to cover some of the capital costs of the housing scheme. As described in Section 1.4.4, some UK-based public funding bodies, such as the Homes and Communities Agency and the Department of Health, require housing providers to comply with the HCA’s development standards, but do not generally specify an energy performance rating to be achieved by a new building (nos. 4 and 6). Housing provider no. 4 felt that, even where no specific energy performance target is explicitly requested, social housing schemes are more likely to attract public funding when it can be demonstrated that they will achieve Code Level Three or above. Similarly, local authorities can exert a strong influence on housing providers in promoting the construction of energy-efficient housing schemes, particularly where a housing provider is managing housing stock on behalf of a local authority (no. 6).

Several of the interviewees reported that they generally use communal heating systems, as opposed to individual boilers, in their extra-care housing schemes (nos. 1, 3, 4, 6, 7, 8, 9, 10 and 13). This was partly due to the perceived energy-efficiency of communal heating systems, although there were other factors (see Sections 3.2 and 3.3). For some interviewees, the use of communal heating also afforded the use of other low-carbon technologies such as ground-source heat pumps (nos. 4 and 13) and combined heat and power units (CHP) (nos. 1 and 3). One architectural assistant suggested that CHP, which operates most efficiently when there is a constant high demand, is particularly suitable for older people’s housing where the occupants are likely to be at home throughout the day (no. 3).

An advantage communal heating systems is that the housing provider can pay the energy company directly for any energy bills, and then reclaim the money from occupants through a service charge. Consequently, occupants will not have the heating turned off for fear that they will not be able to pay the bill as heating is provided as part of the rental agreement (nos. 4 and 13). One interviewee suggested that this arrangement leads to energy profligacy, explaining:

“…when you’ve got a communal heating system… people will have their heating on full and open all the windows… they think it’s all paid for in the rent… so it’s, it’s like a mindset, doesn’t actually matter, “I can have it as hot as I want because I’m not paying for it, because it’s in my rent”.” (no. 12, scheme manager)

To address this concern, some housing providers decided occupants should receive individual metered energy bills (nos. 6 and 7). It was suggested that Automatic Meter Reading (AMR) should be used in these circumstances so that housing providers can monitor occupants’ energy use. Describing a housing scheme where this system was used, one housing provider said:

“It helped us to highlight where tenants might not be purchasing heat… I mean one of the main reasons could be fuel poverty, [that they] can’t afford it, so that’s something we can basically target and go and visit and give them advice.” (no. 7)

3.2. Physiological dimension

Some interviewees implied (nos. 4 and 13) or explicitly stated (nos. 1 and 10) that physiological changes associated with ageing cause older people to “feel the cold.” As one put it:

“Generally speaking older people do like a warmer temperature, again metabolism slows down as you, as you age, become more sedentary, watch TV a lot maybe and, or suffer from health complaints where you do feel the cold, lose body fat and

**Table 2**

<table>
<thead>
<tr>
<th>Scheme no.</th>
<th>Year built</th>
<th>SAP rating (range)</th>
<th>Type</th>
<th>Heating system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scheme 1</td>
<td>2011</td>
<td>Unknown</td>
<td>Small apartment block</td>
<td>Air-source heat pump, under-floor heating</td>
</tr>
<tr>
<td>Scheme 2</td>
<td>2011</td>
<td>83–90</td>
<td>Small apartment block, bungalows</td>
<td>Ground-source heat pump, under-floor heating, solar hot water for bungalows</td>
</tr>
<tr>
<td>Scheme 3</td>
<td>1970 (refurbished 2011)</td>
<td>87</td>
<td>Tower block</td>
<td>Gas-fired district heating system, under-floor heating, analogue heating controls</td>
</tr>
<tr>
<td>Scheme 4</td>
<td>2011</td>
<td>85–90</td>
<td>Small apartment block</td>
<td>Biomass boiler, under-floor heating</td>
</tr>
</tbody>
</table>

1. SAP (Standard Assessment Procedure) is a measure of a dwelling’s predicted energy performance, and is used in the UK Building Regulations; the higher the number, the greater the dwelling's energy-efficiency, with the highest rating being 100.
you are naturally going to feel the cold, more susceptible to, to draughts etcetera.” (no. 10, project manager)

It was suggested that communal heating systems offer a means to ensure that older occupants are not exposed to cold temperatures, as thermostats can be controlled centrally. With this approach, room thermostats operate within centrally controlled parameters, such that occupants “can’t turn the heating off, they can only turn it down to a sort of a pre-determined level” (no. 13, M+E engineer).

The engineer’s recommendation was that the default daytime temperature for dwellings should be around 22–23 °C, and that it should be impossible to turn the thermostat lower than 18 °C. Similarly, the night-time “set back” temperature would normally be no lower than 18 °C, while circulation areas would normally be heated to around 18–20 °C. He also argued that internal temperatures should be higher in older people’s housing, where occupants are less active, than in general-needs housing (no. 13). These recommendations, based on guidance issued by CIBSE (Chartered Institution of Building Services Engineers) and which assume these temperatures will be achievable when the outside temperature is above −4 °C, were echoed by a project manager (no. 10). This interviewee added that he thought it best to allow “a margin of safety” of 2–3 °C to mitigate the effects of severe winters, even though this entails additional capital cost.

From interviews with people involved in managing extra-care housing schemes, it is unclear who, in practise, has the responsibility for setting centralised thermostats. In describing the housing scheme where he worked, one facilities manager described how he initially found the temperature in circulation areas “a bit warm.” Acknowledging that the occupants’ comfort needs might differ from his own, he observed that the residents also “found it uncomfortable” (no. 5). He obtained permission from his line manager to turn the relevant thermostat down from 21 °C to 17 °C, establishing what setting was comfortable through trial and error.

In describing her experiences of working in older people’s housing schemes over a twenty-year period, a scheme manager said:

“I think there is a general expectation that older people need heat and I’m not sure that’s true, ill people need heat sometimes but not just because you’re older.” (no. 12)

She described how internal temperatures are usually very high in older people’s housing, which would often draw complaints from occupants when they first moved in:

“I mean the tenants would all complain, they’d move in and say: ‘Oh my God it’s terrible, it’s terrible,’ but of course once they’ve acclimatised, for them then it’s normal and of course you can’t turn the heating down then because everybody, it, they’re only comfortable if it’s tropical temperatures.” (no. 12)

The scheme manager suggested that once occupants had become used to the high temperatures, they would often take the view that “if I need to cool down I’ll just open the window,” on the grounds that the heating is “paid for in the rent” (no. 12).

An architectural assistant raised a concern that building designers do not always appreciate just how high thermostats are often set in older people’s housing. In particular, she suggested that thermal models often contain inherent assumptions about thermostat settings that are more applicable to general-needs housing rather than to older people’s housing (no. 3).

Another way in which older people’s perceived vulnerability to the cold is scripted into the design of extra-care housing is through the heating of corridors (nos. 1, 5 and 9). As one architect explained, “In a conventional block of flats you wouldn’t bother heating that space,” as people rarely spend much time in circulation areas and there are usually no external walls. However:

“In extra-care we tend to have a very low level heating in there just so that the whole building is warm because obviously older people can feel, feel the [cold] a lot more.” (no. 1)

The same architect also observed that overheating was increasingly a problem in extra-care housing, which he attributed to high levels of insulation and a lack of cross-ventilation (no. 1). Similarly an engineer reported that overheating was an increasing problem in extra-care housing, which he believed was caused by “the constant tightening” of the Building Regulations leading to highly insulated and very airtight buildings. However, this interviewee believed that heated corridors also contributed to overheating in extra-care housing schemes, and he explained:

“What we find now is that we’re not actually heating corridors. The only area where we’re heating a corridor might be at the end where there’s a window or something like that.” (no. 13, M+E engineer)

The interviewee went on to say that in more recent housing schemes he has specified mechanical extract ventilation in corridor spaces to draw air though from apartments in order to prevent the build up of heat (no. 13). A project manager similarly advocated the use of passive ventilation in corridors, saying he would not put radiators in corridors in timber frame buildings (no. 10).

3.3. Cognitive dimension

Several interviewees raised issues around older occupants’ perceived cognitive abilities. It was recognised that some occupants will have dementia, and this was reflected in the design of extra-care housing schemes. For example, yet another perceived advantage of communal heating systems is that they ensure occupants do not have access to boiler controls. As one housing provider explained:

“You can get perfectly, you know, healthy, mentally able people living here or you can get people with quite severe dementia. We do have some people that will just constantly fiddle with boilers and, and controls.” (no. 4, housing provider)

Allowing people with dementia access to gas-fired boilers or gas cookers was seen as a fire risk. With a communal heating system, any gas supplies can be contained within a plant room, thereby minimising the fire risk (no. 4).

Another concern regarding people with dementia is that they might fall from high windows. Explaining this concern, an architectural technologist suggested that people who are not “compos mentis” might “become a risk to themselves” (no. 9). There were also the Building Regulations to consider (no. 8), which specify that “suitable opening limiters should be fitted” if “there is a danger of the operator or other person falling through a window above ground floor level” (HM Government, 2010:10). It was reported that restricted window opening is therefore common in extra-care housing (no. 9). Two housing providers, working for the same organisation, reported receiving complaints from occupants about not being to open windows fully in order to ventilate dwellings (nos. 6 and 8). Referring to a particular tower block, one interviewee explained that occupants have “a desire to open windows to let some of the heat out,” (no. 8), but another interviewee said, “we can’t allow that because [it is] sixteen floors up” (no. 6). Although it is generally possible to disengage window opening restrictors, it was felt necessary to “police” occupants’ behaviour to prevent this from happening (no. 6).

Some interviewees suggested that older occupants who do not have dementia might experience memory problems (no. 12) or
simply be prone to confusion, particularly with regard to new technologies (nos. 4, 6, 10 and 12). There was concern about heating systems that have a slow response time, such as under-floor heating (nos. 1, 4 and 12). As one architect put it, “Human nature is [if you] feel a bit chilly, turn it up” (no. 1). It was therefore suggested that some occupants might struggle to adapt to a heating system which did not respond instantaneously, but instead required the occupant to anticipate what setting they would require in a few hours time. A scheme manager suggested that this idea was “tough to grasp and particularly with our demographic” (no. 12). Describing the selection of heating controls, a project manager said:

“Analyse the elderly couple in the flat, what do they want out of a thermostat? Ease of operation, minimal interference with it, they just want it to do its job… okay, there might be extra gubbins the engineer can interrogate behind that [but] at the end of the day a lot of older people… just want to turn the heating off at night and turn it on in the morning, that’s what they understand.” (no. 10)

A scheme manager expressed concern about a particular heating control device, which had “four different options, which is a bit tricky for people to get their heads round” (no. 12). A housing provider, explaining why installed analogue timers in an extra-care housing scheme said, “we didn’t [choose] the digital programmer because we’re aiming at people over sixty with different care needs.” He regarded the digital programmers as complex to use, while analogue timers were “simple” (no. 6).

Some interviewees suggested that in practise the selection of heating controls was often left to contractors (nos. 10 and 13). One project manager explained how many extra-care housing schemes are built under “design and build” contracts in which the contractor takes responsibility for the design of a building as well as its construction. If a client, that is, the housing provider developing an extra-care housing scheme, specifies a particular thermostat, then the client will be liable if the thermostat fails and needs to be replaced soon after the building is complete. If the contractor selects the heating controls, the contractor carries the risk (no. 10). The contractor’s decision can be influenced by a tightly worded specification (nos. 10 and 13), but fear of the costs that might be incurred by faulty heating controls often causes conservative choices to be made (no. 10), and sometimes the issue is simply overlooked (no. 13). A housing provider candidly described this latter situation:

“Like with a lot of things, if you don’t pick it up before it happens, it’s specified, it’s gone, it’s been bought and it’s been installed before you think, oh, I needed to, I should have, you know, and sometimes that, that happens, and then with hindsight you think, oh I should have changed all those…” (no. 4)

3.4. Physical dimension

Interviewees identified a number of physical impairments they associated with older people and which had implications for building design. Several interviewees suggested that sight loss could make it difficult for some occupants to use heating controls (nos. 4, 10, 11 and 12). A project manager suggested that ideally heating controls should have “a big digital read out” and “easily read buttons, bright buttons” (no. 10). A scheme manager raised concerns about the heating controls installed in a particular housing scheme, saying:

“It’s really not a user-friendly system at all and particularly not for our age group... I mean you can’t see [the markings on the dial], you’ve virtually got to feel them with your finger, so what a lot of our residents have done, they’ve put a splotch of, well [OCCUPANT'S NAME] has, put a splotch of nail varnish on it so she can see it.” (no. 12)

The scheme manager’s comments reflect observations made by other interviewees that when it comes to heating controls, user representations of older people are discussed, but are not necessarily scripted into designs.

Two housing providers and an architectural technologist discussed concerns that older occupants might accidently burn themselves on conventional radiators and they reported that, for this reason, most extra-care housing schemes are fitted with low-surface temperature radiators or with under-floor heating (nos. 4, 6 and 9). An engineer suggested that low-surface temperature radiators are very bulky and are “just something else for an elderly person to bump into.” He advocated under-floor heating (no. 13). Several interviewees suggested that incontinence is common amongst older people and that this affected how they designed buildings (nos. 1, 10 and 13). An architect suggested that a problem with under-floor heating was that any urine on a heated surface could evaporate quickly, but bacteria would remain, leading to a smell (no. 1). A project manager and an engineer advocated ventilating corridors (as discussed in Section 3.2) partly in order to help reduce unwanted smells (nos. 10 and 13).

An architectural technologist suggested that many older people suffer from mobility impairments and that consequently it was important to ensure that floor layouts allowed sufficient space for wheelchairs to turn and hoists to be moved around furniture. The interviewee noted that, if insufficient depth is allowed for external walls and calculations show that it is necessary to increase the thickness of insulation, this could cause a room to be too small to accommodate a wheelchair turning-circle or a hoist (no. 9).

4. Discussion

4.1. User representations

Interviewees identified certain characteristics, attributed to those who live in extra-care housing, which impacted on design decisions. Occupants were characterised as having low incomes, being vulnerable to cold conditions, prone to confusion, and likely to suffer from physical or cognitive impairments. Interviewees did not claim that all older occupants would necessarily exhibit all these characteristics. The absence, however, of discussion of a broader range of user representations could indicate interviewees’ tendency to homogenise the attributes of people of a similar chronological age to each other, which could be regarded as ageist (Bytheway, 2005).

These user representations centre on institutional and biological notions of ageing, which Day and Hitchings (2011) suggest are predominant in policies and policy debates around older people’s winter warmth. Institutional age concerns the way many older people have retired from fulltime employment, and consequently might not be able to afford adequate heating owing to reduced income. The biological understanding of ageing is that the human body’s ability to maintain core temperature diminishes with age, causing older people to be more vulnerable to the cold. The high prevalence in the older population of health pathologies, such as heart disease and respiratory problems, is seen as increasing the risk that living in a cold environment will cause death. Cognitive and physical impairments are judged to make it difficult for older people to operate heating systems. People with dementia are regarded as unsafe near gas-fired boilers or high windows.
It is possible that housing providers and architects construct these user representations in response to the way older people are discussed by policymakers and public bodies. In particular, where it is necessary to obtain public grant funding for a housing scheme to be viable, it seems likely that housing providers will need to present their proposals in terms that reflect the language used by public funding bodies. However, this is an area that requires further research.

It has been observed that the wider population is encouraged to keep thermostats on a low setting in order to reduce the energy used for heat, and hence reduce carbon emissions (Boardman, 2007). Previous studies have raised questions about how issues around sustainable heating are balanced with discourse around older people’s winter warmth (Hitchings and Day, 2011). The reports, by some interviewees in this study, of older people’s housing schemes having high internal temperatures suggests that currently concerns about older people’s perceived vulnerability to the cold are privileged over concerns to reduce carbon emissions. Interviewees suggested that communal heating is often used in older people’s housing partly because it allows thermostats to be controlled centrally by the building’s managers. In this study, it was not possible to ascertain precisely who controlled these central thermostats; even the facilities manager who reported adjusting a thermostat for communal spaces was obliged to seek permission from his superiors. Further research is required to ascertain precisely who decides how a central thermostat should be set, and whether thermostat settings reflect housing provider’s policies or result from ad hoc decisions.

Expounding on their observations of the concepts of ageing that underpin policies around winter warmth, Day and Hitchings (2011) note that chronological age is often used as an explanatory variable. In other words, a person’s date of birth is used as a proxy for their probable physical condition or financial situation. The problem with this is that it leads to an over-assumption of similarity between people of the same age and disregard for the diversity of the older population, ultimately leading to stereotyping.

The interviews conducted for this study revealed little diversity in the user representations drawn on in the design older people’s housing. The study suggests there might be a tendency, on the part of housing providers and building designers, to design buildings for an imagined user who represents the ‘worst case scenario’. In other words, to assume that the occupants will be vulnerable to the cold, suffer from dementia, have a low income and few assets. That building designers should take this view is understandable to a degree, as any housing scheme designed specifically for older people will have to meet the needs of the person in the most challenging situation. Also given that the interviewees who participated in this study work primarily on social housing, we should expect the occupants to have little income and few assets.

Given that vulnerability to cold conditions depends partly on health and physiology, a question remains as to whether older occupants are universally vulnerable to the cold. There is certainly a wide range of health and care needs within the population living in extra-care housing (Darton et al., 2012). It therefore seems likely that there will also be a wide range of needs with regard to thermal comfort. The risk is that by designing for an imagined older person who needs warmth, allowance is not made for the older occupant who would prefer to have the thermostat at a lower setting.

Reports that some occupants complain about the excessive heat when they first move into an older people’s housing scheme, but later adapt to the high temperatures, could be interpreted as meaning that older occupants are internalising ideas about older people needing (or deserving) increased warmth. Reports that older occupants sometimes open windows during the heating season, in order to achieve thermal comfort, suggest that insufficient consideration is sometimes given to occupants who prefer cooler conditions. While such practises might result from wilful profligacy, as suggested by one interviewee, it might also be the case that the occupants are unable to achieve thermal comfort by any other means.

4.2. Scripts

The user representations identified in the data, and described in Section 3, were reportedly scripted into the design of extra-care housing schemes through the inclusion of specific building features. Communal heating was regarded as energy-efficient, therefore leading to lower energy bills and reducing costs for occupants on low incomes. Additional advantages included the centralisation of thermostat controls, allowing scheme managers to ensure that the correct room temperatures were maintained throughout the building. People with dementia could also be kept away from boiler controls, reducing fire risk. Automatic meter reading allowed scheme managers to monitor occupants’ energy use to ensure that all were drawing heat.

Some interviewees suggested that heated corridors ensured that occupants would not be exposed to the cold while they were within the building, although other interviewees questioned the need for this. Concerns that some older occupants might be accidentally burned by conventional radiators led interviewees to regard either low-surface-temperature radiators and under-floor heating as necessary, although interviewees had differing views as to which was preferable. Restricted window opening was regarded as necessary to prevent occupants accidentally falling through open windows. Interviewees also discussed the selection of heating controls, with one interviewee citing the selection of “simple” analogue controls over digital controls.

In considering the potential impact of the selection of these features, it is perhaps instructive to consider the observations from two interviewees about overheating in extra-care housing. Both building designers, an architect (no. 1) and an M+E engineer (no. 13), had independently experienced problems with completed housing schemes overheating. Both believed that high insulation levels and inadequate ventilation were contributing factors, but one (no. 3) believed that heated corridors exacerbated the problem.

Previous research indicates that excessive heat and poor ventilation is a problem for occupants of extra-care housing (Barnes et al., 2012). The HAPPI Report (HAPPI, 2009) and design guidance issued by the Department of Health (Nicholson et al., 2008) also cautions that overheating is becoming a critical issue in the design of extra-care housing. More generally, there is a growing awareness in the UK that new-build energy-efficient housing schemes are at risk from overheating (Peacock et al., 2010, Jowett, 2011). High standards of insulation and air-tightness are believed to be two of the key factors in this problem.

There are characteristics of extra-care housing that perhaps make it particularly prone to overheating. Communal heating systems have been identified as having the potential to cause overheating in all types of housing. Communal heating systems feature distribution pipes that run through corridors and common spaces, and through which hot water is usually pumped throughout the year, even if no heat is drawn off by the pipe-runs in individual apartments. Certainly, where space heating and hot water are provided by the communal heating system, the CIU (i.e. heat exchanger) in each apartment will be permanently charged with hot water throughout the year to meet hot water demand. The heat emitted by the pipe-work and CIU can contribute to internal heat gains (NHBC Foundation, 2012). Clearly, heating in corridors will increase these internal heat gains.

Heat can be trapped in well-insulated buildings unless there is adequate ventilation. Restricted window opening limits
ventilation in most extra-care housing schemes. The problem is likely to be exacerbated by the way in which many apartments in extra-care housing schemes are single aspect, that is, all the windows are on one side of the apartment, making it difficult to obtain cross-ventilation.

It seems that the very features specified in order to protect older occupants from the cold can cause overheating. This is a concern, not just because it is likely to cause the occupants discomfort, but also because it might adversely affect occupants’ health (Public Health England, 2014), and is likely to lead to wasteful practices. The occupants, mentioned by one interviewee, who open their windows during the heating season, might be doing so because it is the only way in which they can achieve thermal comfort.

5. Conclusion and energy implications

It must be acknowledged that this paper’s findings are based on a very small sample, but they do indicate areas where further research is required. In particular, further research is required to establish the extent to which the findings of this paper are representative of wider trends. More investigation is also required to establish what impact government policies on housing and older people’s winter warmth have on the design and management of older people’s housing. In particular, currently it is not clear to what extent excessively warm dwellings result from the discourse around older people’s warmth.

The findings of this paper suggest that there is a need to promote consideration of a wider variety of user representations in the design of older people’s housing, in order to allow for those occupants who are content to have the thermostat at a lower setting. It is also necessary to ensure that new buildings are not designed in ways that are liable to cause them to overheat. Following these recommendations will help to create buildings that are energy-efficient in practise, and not just in terms of predicted energy performance ratings.

The paper’s findings indicate that housing providers, when trying to secure public funding for the capital costs of a housing scheme, respond both to the formal requirements but also to the language used by policymakers. Encouraging housing providers to consider a wider range of occupant-needs can be realised both formally, through building codes such as the current Design and Quality Standards, and through changing the rhetoric around older people’s thermal comfort. Technical issues, such as overheating, probably require a formal approach, and it should perhaps be compulsory for building designers to undertake thermal modelling at the design stage in order to ensure that proposed buildings will not overheat.

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