“It’s not too bad” – The lived experience of energy saving practices of low-income older and frail people

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Key message

To improve equity and health outcomes for low-income, older and frail householders,

residential energy efficiency recommendations need to consider

• the sensitivity of this population group,
• the material characteristics of the housing stock,
• the meanings of warmth.
Research problem
Need for a better understanding of simple ways of saving energy and keeping warm & their meanings for a transition towards a low-carbon and equitable society.

Common policy approach
1) Voluntary low-cost measures (e.g. ceiling insulation, draught proofing)
   - Difficult for low-income householders and tenants
   - No mandatory standards for rental properties in Australia
2) General no-cost behavioural recommendations (e.g. temporal and spatial heating restrictions, layering of clothes in winter)
   - Interpretation?

Desirable opportunities to save energy ↔ Regrettable coping and adaptation responses
Assessment in terms of equity and health

Socially shared practices shaped by material, social and cultural contexts

Assessment of equity and health outcomes of energy conservation activities, requires good understanding of

• preconditions of practices
• meanings to householders
• evaluation of intervention outcomes

Population: low-income, older and frail people, living independently at home, near Melbourne
Aims

• Identification and description of practices of heating and keeping warm

• Appraisal of these practices in terms of health and equity

• Exploration if and why these practices changed (or not) after a low-cost retrofit intervention
Health Study
Adjunct to SECCCA’s (LIEEP) Energy Saver Study

Flow of households through Health Study

320 households recruited by SECCCA

Quasi-randomisation into study groups

Intervention group
16 households

Control group
14 households

Winter 2014 Baseline

Retrofit only; no behavioural advice

Winter 2015 Follow-up

Draught proofing, insulation etc.

1 landlord sold home

16 households

13 households

Simple retrofits
Methodology

Mixed methods:

• Indoor temperature monitoring
• Outdoor temperatures by Australian Bureau of Meteorology
• Electricity and gas usage monitoring
• Interviews before and after retrofit
Analysis

Daily mean room temperatures:
• Standardisation to ‘average’ winter days
  \((9°C < \text{daily mean outdoor temperature} < 11°C)\)
→ Measurement of underheating
  (WHO 1985, Public Health England 2014)

Daily mean heating energy consumption:
• Standardisation to ‘average’ winter days
  \((9°C < \text{daily mean outdoor temperature} < 11°C)\)
→ Non-parametric statistical analyses to assess changes

Interviews:
• Interpretative phenomenological analysis
Characteristics of dwellings

<table>
<thead>
<tr>
<th>Predominant characteristics of sample dwellings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control group (N=13)</td>
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<tr>
<td>----------------------</td>
</tr>
<tr>
<td>Detached house</td>
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<tr>
<td>Brick veneer external wall</td>
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<tr>
<td>Concrete slab on ground</td>
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<tr>
<td>Ceiling insulation &lt;110mm</td>
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</tbody>
</table>

Characteristics of main heating system

- Control group (N=13): Portable 7, Space Cooling (wall/ceiling mounted) 6, Ducted 0
- Intervention group (N=16): Portable 8, Space Cooling (wall/ceiling mounted) 5, Ducted 3

Gross floor areas (measured)

- Control group (n=10): 131.65m²
- Intervention group (n=10): 120.50m²
Characteristics of householders

**Predominant characteristics of sample main householders**

<table>
<thead>
<tr>
<th></th>
<th>Control group (N=13)</th>
<th>Intervention group (N=16)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Female</td>
<td>11</td>
<td>85%</td>
</tr>
<tr>
<td>Age 70+ years</td>
<td>10</td>
<td>77%</td>
</tr>
<tr>
<td>Away from work (incl.</td>
<td>12</td>
<td>92%</td>
</tr>
<tr>
<td>retired)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Own the dwelling outright</td>
<td>12</td>
<td>92%</td>
</tr>
</tbody>
</table>

Main participants' health status (Baseline, winter 2014)

- Have you experienced any wheezing or whistling in the chest in the last 12 months? - Yes
  - Control group (N=13): 46%
  - Intervention group (N=16): 56%

- Do you have any long-standing illness, disability or infirmity? - Yes
  - Control group (N=13): 77%
  - Intervention group (N=16): 94%
Selected four practices

= no-cost recommendations by state and/or local government bodies

1) Turning off the heater overnight  
   (SECCCA 2016)

2) Keeping thermostat setting between 18-20°C  
   (SECCCA 2016, Sustainability Victoria 2016)

3) Heating only occupied rooms  
   (SECCCA 2016, Sustainability Victoria 2016)

4) Putting on extra layers of clothing  
   (SECCCA 2016, Sustainability Victoria 2016)
1) Turning off the heater overnight

- 28/30 ← routine, concerns about costs
- 2/30 (homes with central heating) ← muscle function, mental health and comfort in morning

"I don’t think it makes too much difference to you, does it? Yeah, as long as you keep yourself warm."

Fran, age 82, diabetes, mobility impairment

Low awareness of health risks
Turning off the heater overnight
- Responses to cold in morning

• Going back to bed after switching on heater (but not for carers)

  “I always get up early and then I turn the heater up to encourage him to get out of bed.”
  Tara, age 63, no cardiovascular or respiratory problems

• Use of *expensive* electrical or unflued gas heater to heat up home quickly

  “We use the little gas heater. .. Those type of gas heaters heat up a lot, and eat up oxygen. It’s no good for [wife with chronic lung disease]. So, we don’t run it for any length of time.”
  Larry, age 83, diabetes, heart problems, cancer

Rationalisation of risks

Chemical pollution
Turning off the heater overnight
- Outcome of intervention

Underheating in LRs during awake hours:
Net benefit 46min (not stat. sign., small size effect)

Underheating of living rooms (<18°C) during 8am - 10pm on average winter days

Control group (n=5)  
Winter 2014: 258 min  
Winter 2015: 264 min

Intervention group (n=7)  
Winter 2014: 64 min  
Winter 2015: 116 min

$p = .755; r = .12$
I'm frightened, because I'm thinking, 'oh my God, I never left a heater on all night at all yet'. [...] But you know, when I'm feeling very generous with meself, well, I'll do it.”

"But [new RC AC] takes a little while. [...] If it’s really cold morning [...] of course I’ve got the heater on. ” Betty, age 89
2) Keeping thermostat setting between 18-20°C

- Centrally heated homes
  8/15 19-20°C
  7/15 up to 24°C

- Single thermostat could lead to overheating = energy waste

Karen, age 75, Parkinson’s disease

“I usually set it on twenty, which isn’t really warm enough to really keep you warm but with – if you put another cardigan on, it’s not too bad. ‘Cos they tell me, um, every degree over twenty, it really becomes expensive.”

Minimisation of discomfort

Extra clothes

- Room heated homes:
  2/15 morning 24°C → later 20-22°C
  5/15 “low”/“one bar”/“medium”/“three-quarters”
  8/15 “don’t know”

Cold sensitivity

No ability to monitor temperature
Keeping thermostat setting between 18-20°C
- Change in practices?

• Intervention group: in one centrally heated home, night setting lowered from 16°C to 14°C

> “I figured I could just reduce it a bit more.” Sarah, age 54, nerve pain

• Control group: in one room heated home, daytime setting lowered from ‘7’ to ‘5’ after cold sensitive husband had died

> “Well, I don’t feel the cold here as much as he did you know. I dress warm and I don’t need it on half as much.” Fran, age 82, diabetes, mobility impairment
3) Heating only occupied rooms

**Dependent on heating system**

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**Energy conservation**

- **Baseline Central heating group (n=14)**
- **Baseline Room heater group (n=14)**
- **Follow-up Central heating group (n=14)**
- **Follow-up Room heater group (n=14)**

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"Our bedroom [...], the Arctic Circle. [laughter]."

Noeleen, age 82, arthritis, emphysema

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**Unevenness in temperature**
Heating only occupied rooms
- Bundled with…

• Keeping warmth within heated room

• Use of portable electric heaters

* Tripping hazards
* Socially unacceptable
* Expensive
* Electrical hazard
Heating only occupied rooms
- Outcomes of intervention

Evenness (whole day):
Net mean increase in temperature difference in intervention group 0.12°C (not stat. sign., small size effect)

Diurnal variations of unevenness in temperature on ‘average’ winter days

Most marked in evenings
Heating only occupied rooms
- Changes in practice?

One control home – technical change:

- independent installation of reverse cycle air conditioner afforded switching off the central heating system that used to heat the upper storey

Unsatisfactory outcome

“So this is our new visitor in the house. [...] But it’s not very effective because the position is in the wrong place.”

Tara, age 63, no cardiovascular or respiratory problems
4) Putting on extra layers of clothing

- All householders adjusted their clothing level in winter

**Perceived oddity**

“Everybody says I am overloaded.”

“[laughs] I’m like the Michelin woman.”

**Humour**

“If he has got to go to a hospital, they’d never get to his body with all the clothes he’s got on, [laughter] he’d die.”

**Emily, age 85, about her husband, age 76, cardiovascular problems**

*Pride in ingenuity, but socially not acceptable*
Putting on extra layers of clothing
-Changes in practices?

Subtle shift in two intervention homes towards more clothing, despite warmer living rooms ← increased cold sensitivity

<table>
<thead>
<tr>
<th>House 14 Intervention</th>
<th>House 22 Intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Living room</strong></td>
<td><strong>Living room</strong></td>
</tr>
<tr>
<td>(on ‘average’ winter days)</td>
<td>(on ‘average’ winter days)</td>
</tr>
<tr>
<td>Change in daily mean living room temperature (°C)</td>
<td>Change in daily mean living room temperature (°C)</td>
</tr>
<tr>
<td>1.5</td>
<td>0.1</td>
</tr>
<tr>
<td>17.35 → 18.8</td>
<td>19.51 → 19.6</td>
</tr>
<tr>
<td>Change in underheating of living room during awake hours (min)</td>
<td>Change in underheating of living room during awake hours (min)</td>
</tr>
<tr>
<td>-270</td>
<td>-30</td>
</tr>
<tr>
<td>390 → 120</td>
<td>30 → 0</td>
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</table>
No-cost behavioural recommendations

- Dependency on heating system → limited applicability
- Already common → limited effectiveness
- Temporal and spatial heating restrictions → underheating & potentially harmful technical adaptations → questionable soundness of advice

Low-cost retrofits

- Did not eliminate underheating
- Adaptation practices persisted
Discussion

Interpretation in terms of health equity

• Positive models of saving energy and building resilience

• Non-constraints related heating restrictions and exposure to indoor cold are not uncommon in Australia
  → underheating avoidable, but not necessarily unfair or inequitable

BUT: Sensitivity of older and frail population → health risks

• No-cost behavioural recommendations
  → normalise adaptive responses
  → may hinder self-identification of vulnerable households
  → place responsibility on individuals

Recommendation:

Policy focus on providing adequate indoor warmth through extensive improvement of building quality

– energy efficiency rather than energy reduction

SECCCA, House in Order. How to achieve energy efficiency and performance in your home, South East Councils Climate Change Alliance, Narre Warren, Victoria, 2016.


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