

 **HOGESCHOOL  
UTRECHT**

**Dementia-friendly desi**  
How to design the physical indoor environment  
at home for people with dementia



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Dementia and Design - Challenges and Opportunities for Health Care Professionals  
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 **Contents**

- Introduction
- Indoor environment
- Thermal comfort
  - Solutions
    - Thermostats
- Light
  - Solutions
  - Attention for colour temperature
- Final thoughts

2

**Introduction** 

- Ageing-in-place: all developed nations 73%
- NL: 1 / 3 older persons with severe physical limitations (100,000 persons) not in suitable dwelling. Dementia more challenging
- Home may hinder daily functioning
- How to design a dementia-friendly home?

3

**Indoor environment** 



- Physical indoor environment comprises:
  - thermal environment, indoor air quality, lighting, acoustic environment
- *It constitutes all that the individual hears, sees, feels, and smells*
- Today: focus on thermal comfort and lighting

4

**Thermal comfort 1** 

- "State of mind, which expresses satisfaction with the indoor climate or one of its parameters."
- Definition difficult to apply: Unknown 'state of mind'
- Thermophysiological definition: "Minimum rate of nervous signals from heat proprioceptors in skin and hypothalamus." (Mayer, 1993)
- Other perception of indoor climate

5

**Thermal comfort 2** 

- PWD may lack ability to express themselves reliably other than by expressing (dis)satisfaction via certain behaviours
- Warner (2000): carers' views of a comfortable room temperature may not be the same
- Steinfeld on his father with dementia (2002): Father's "ability to sense thermal comfort seemed to deteriorate. There were many days when I would arrive to find the heat well near [32°C] or more. In the summer, the opposite occurred with the air-conditioning."

6

### Thermal comfort 3



- Consequence of warm discomfort → Undressing = exhibitionist behaviour / sexual disinhibition actually just thermal dissatisfaction Patient files...
- Consequence of cold discomfort → Put on additional or inappropriate clothing Even cross-dressing reported in the literature
- Hat in summer

7

### Solutions at home 1



- Warner (2000): "When bathroom is too cold, one knows it is uncomfortable". No link between temp. and comfort. Frustration, anger, wanting to flee.
- No electrical heaters, but IR heat lamps in ceiling
- Radiators blocked and covered. Pipes insulated
- Floor heating, low-temperature, oedema

8

### Solutions at home 2



- Do not leave windows/balcony doors open
- Risk of escaping. Crawling through windows (especially in high-rise building)
- Position of HVAC-outlets.
- Moving curtains, papers. Presence of someone else in room, even ghosts and thieves. Suspicion and fear



9

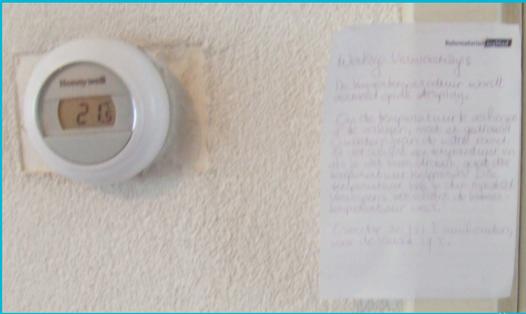
### Dementia and thermostats



- If cognition allows, thermostats give opportunity to control temperature to a certain extent
- Complexity of technology has consequences for use of thermostats and HVAC
- Needs and abilities differ per individual: cognition, apraxia, tremors, muscle strength, vision, language (English)
- Familiar technology may help

10

### Dementia and thermostats

11

### Dementia and thermostats



Galasko D. *European Journal of Neurology* 1998;5(suppl 4):S9-S17

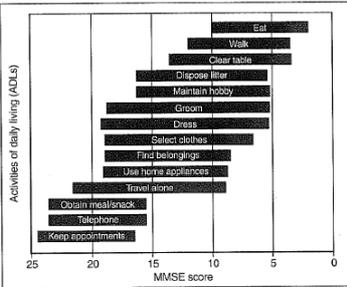


FIGURE 2. Correlation between the Mini-Mental State Examination (MMSE) score and ability to perform daily activities. Adapted with permission, Galasko *et al.*, 1997.

Activities of daily living (ADLs)	MMSE score (approx.)
Keep appointments	18
Telephone	18
Obtain meals/snack	18
Travel alone	18
Use home appliances	18
Find belongings	18
Select clothes	18
Groom	18
Dress	18
Grasp	18
Maintain hobby	18
Dispose litter	18
Clear table	18
Walk	18
Eat	18

12

### Dementia and thermostats

- If thermostats cause difficulty operating, covers can be placed over the controls, disguised, or placed out of sight.
- System's delay problematic when forgetful. "Malfunctioning or broken"

People forget manipulation of system's interface

And then?



13

### Dementia and thermostats

- Overcompensation. Turning button all the way up. Extreme temperatures indoors.
- New secure thermostats with pre-set acceptable range
- So how to design thermostats?




14

### Good technology

Technology should (Orpwood et al., 2004):

- Not require training (intuitive)
- Look familiar
- Not take away control from user
- Require minimal user interaction
- Reassure user





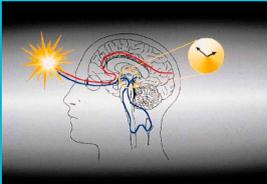
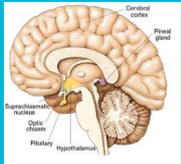


15

### Light has a positive influence on well-being and health

- visual
- non-visual

Of importance for people with dementia


16

### Ageing of the eye

- Less blue light reaching retina: yellowing of eye
- Different perception of colours
- Effects on biological clock (SCN)
- Retinal ganglion cells
- Bluegreen light: melatonin suppression action spectrum



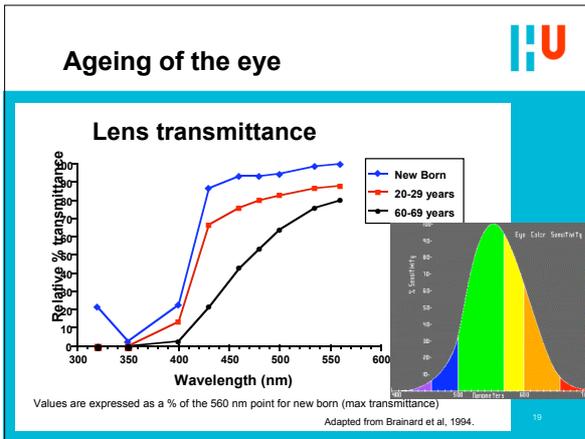
17

### Ageing of the eye

- 90% problem behaviours. Cause for institutionalisation
- Great variation in sleep wake cycle. Even reversed!
- Caused by damage to biological clock



18



### Light therapy

- Table-mounted bright light applications
- Requires (scarce!) 'exposure' staff
- Fixation of subjects
- A different solution please!  
Ambient bright light



- ### Ceiling-mounted luminaires
- The Netherlands front-runner in research (van Someren et al., 1997; Riemersma-van der Lek et al., 2008; van Hoof et al., 2009ab)
  - Short and long-term effects:
    1. Decrease of restless behaviour
    2. Improved sleep
    3. Delay in cognitive decline
    4. Decreased feelings of depression

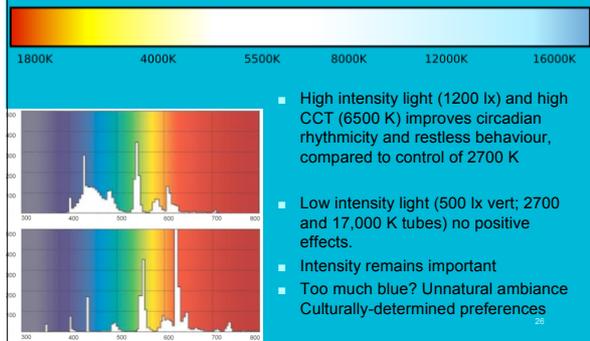
### Ceiling-mounted luminaires



- No harmful effects of light
- No concerns for technological applications in ceiling
- Research based on intensity (illuminance levels, E [lx])
- Forbes et al. (2004): not sufficient evidence, RCT

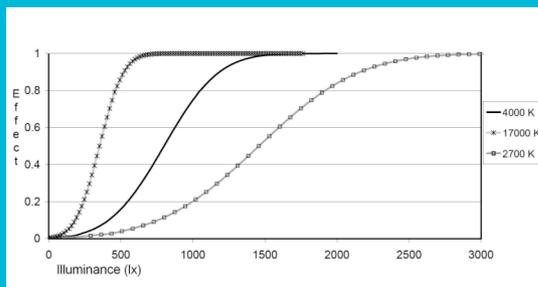
25

### van Hoof et al. 2009 Incorporation of colour temperature



26

### Importance of colour temperature



27

### Final thoughts



- Odours, indoor air quality and sounds of importance
- Integrated approach needed
- Environmental interventions including home modifications, task simplifications, object modifications and assistive technologies/devices
- More research and implementation in practice

28

### Final thoughts



*"We must be realistic. Alzheimer's is a disease of the mind, not of the home. The environment is not a treatment, and it offers no cure. But many problems related to the disease can be lessened for the person with [Alzheimer's disease] and especially for the caregiver by making changes in the home environment"* (Warner, 2000, pp.2-3).

29