White – Tunable Case Studies

DOE SSL Technology Development Workshop

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Powering forward. Together.

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Agenda

- What Seniors need
- What Caregivers need
- Visual & nonvisual effects of light
- Project & technologies
- Awesome outcomes

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Full reports available

- DOE/PNNL report: http://energy.gov/eere/ssl/gateway-demonstrations

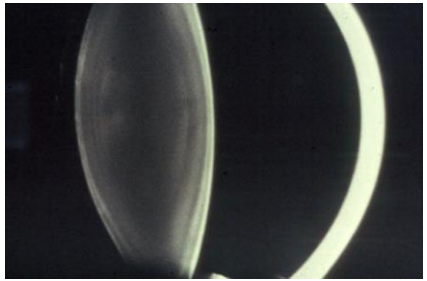
- SMUD Customer Advanced Technologies report: https://www.smud.org/assets/documents/pdf/ACC-Care-Center-Lighting-Project.pdf

What Seniors need

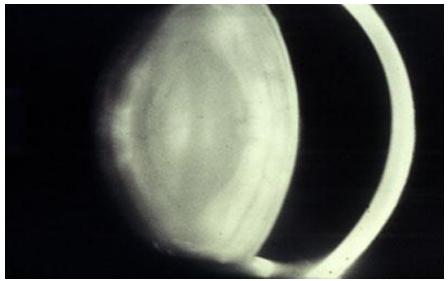
- Seniors have very specific lighting requirements:
  - Pupil is smaller and almost fixed in size
  - Less light enters the eye
  - Difficult to adjust to changes in brightness

What Seniors need

- Lens thickens and becomes slight amber color
  - Difficult to focus
  - Absorbs light and cancels the blue range
  - Causes light to scatter within the eye



Lens of a 10 year old



Lens of a 65 year old

Photo courtesy of Center of Design

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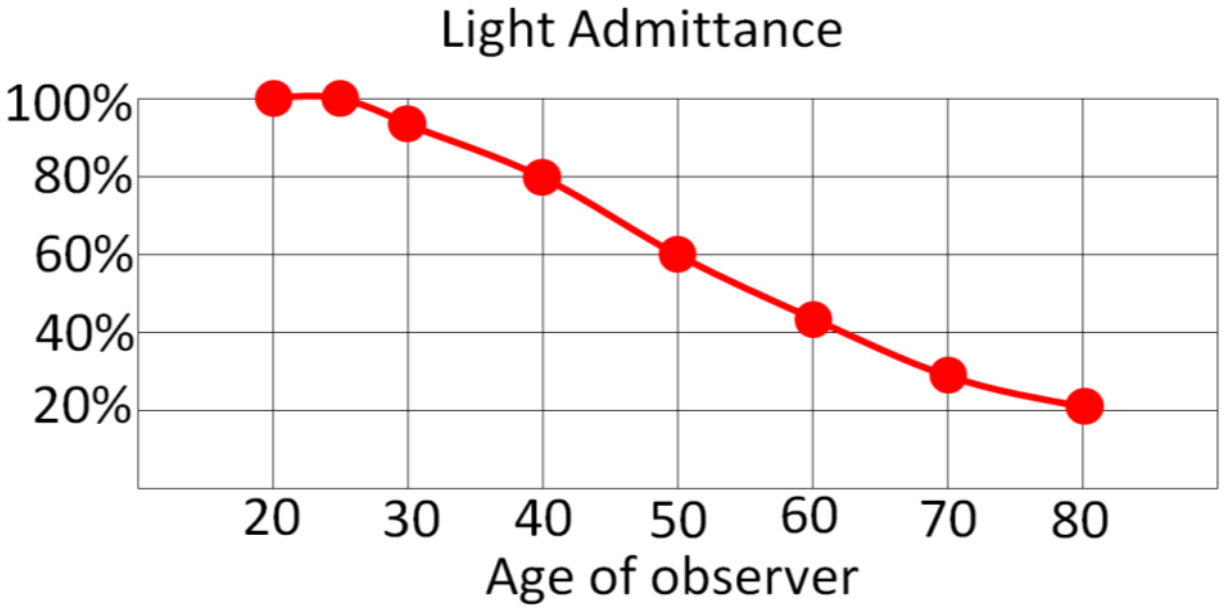
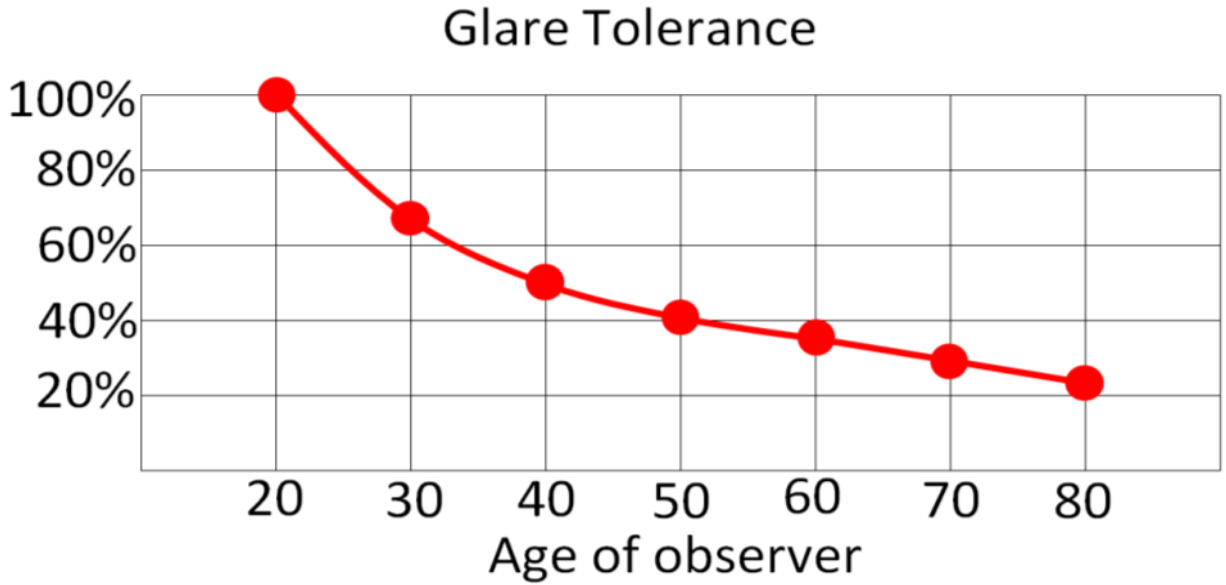
What Seniors need

More light is needed as we age



What Seniors need

But glare is less tolerated…



What Seniors need

- Seniors have very specific lighting requirements and the existing lighting is often inadequate
  - Postural control and stability are dependent on information from the visual system
- Lighting has a big impact upon people
- This sector is long overdue for a lighting makeover

Photo courtesy of Center of Design

What Caretakers need

- Caretakers need enough light to see their tasks
- Caretakers need to be “alert” and “awake” during all shifts
- They need to be able to operate the lighting controls intuitively
- They need to be included in any new lighting designs

What Caretakers need

And they need to understand the concept of circadian lighting to use appropriate color temperatures accordingly

Visual & nonvisual effects of light

At least five important circadian factors have been identified:

1. Spectral content of the light source
2. Intensity level of the light source
3. Duration of exposure
4. Timing of the exposure
5. Age / health of individuals

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Project & technology

Partner with the Department of Energy (DOE) Gateway Program, manufacturers and a local nursing facility ACC Care Center (nursing and rehabilitation center) to test:

- Tunable-white LED lighting systems (circadian)
- Indoor night lighting options (safety)

Project & technology

Project Goals

- Investigate different lighting techniques and applications for upcoming remodel and addition at ACC Care Center
- Explore the potential benefits and challenges of circadian lighting:
  - Improve the lives of at least three residents
  - Enhance the nursing staff experience

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Project & technology

Resident rooms: Fluorescent over-the-bed luminaire

Project & technology

Resident rooms

- Tunable-white LED cove lighting above the beds and side walls
  - Cove lights hidden behind a plastic gutter
  - Commissioned controls per Lighting Research Center (LRC) protocol to change automatically (Light & Health Institute)
- LED over-the-bed light

Project & technology

Resident rooms

- Increased the ambient lighting by 3 times the original amount

Project & technology

Resident room schedules

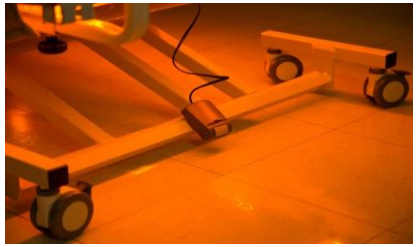
- 7 a.m. – 2 p.m.: 6000K
- 2 p.m. – 6 p.m.: 4100K
- 6 p.m. – 8 p.m.: 2700K
- Nightlight option: 2400K




Project & technology

Resident rooms

- Nightlights
  - Amber LED rope lights on motion sensors under the beds
  - Amber LED low-level lights on motion sensors in walls



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Project & technology

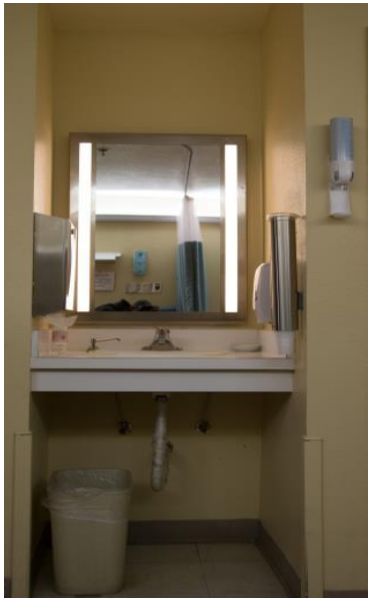
Resident restrooms

- Glary globe on ceiling
- Glary fluorescent luminaire over vanity

Project & technology

Resident restrooms

- Removed the vanity overhead luminaire
- Replaced the existing mirror with an illuminated LED mirror
- Replaced glary globe with surface mounted LED fixture with nature scene (leaves)
- Replaced existing handrails with new handrails with integrated amber LEDs controlled by motion sensors
- Doubled the lighting during the day plus +++



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Project & technology

Hallway: 4100K two lamp fluorescent surface mounted luminaires

Project & technology

Hallway

- Replaced the fluorescent luminaires with tunable-white surface mounted LED luminaires
- Added automatic controls for both dimming and tunable-white

Project & technology

Hallway schedules

7 a.m. – 2 p.m.: 6500K @ 66% output

2 p.m. – 6 p.m.: 4000K @ 66% output

6 p.m. – 7 a.m.: 2700K @ 20% output

Over 65% energy savings

Project & technology

Nurse’s station

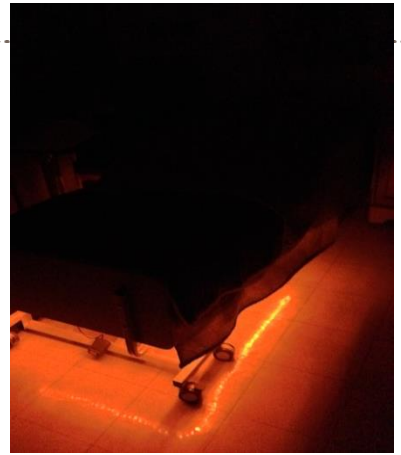
- Replaced 3-lamp fluorescent troffers with recessed tunable-white LED luminaires
- Manual controls
- Feedback from nurses includes:
  - Very mindful they are working in an environment that is improving patient care
  - Enjoy changing the color of the station lighting depending on shift

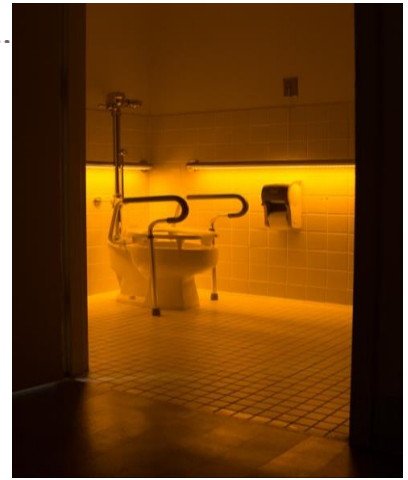
Awesome outcomes!

Reduction in falls

“The quarter before the lights were installed we had 5 falls on Cherry Lane. The quarter after installation the number reduced to 3 but, more importantly, *there were no falls on Cherry Lane in the last three months.”*

- ACC Administrator





Awesome outcomes!

- Residents are sleeping through the night
  - Sleeping in their beds
  - They LOVE the night lights
  - Reduction in psychotropic and sleep medications
- 41% reduction in behaviors
  - Yelling
  - Agitation
  - Crying
- 71% reduction in behaviors in one particular dementia resident

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Awesome outcomes!

- Other residents hanging out in “Cherry Lane”
- Nurses embracing the new lighting for both the residents and the late night shift
- Attending Physician is highly involved
  - Currently prescribes daylighting
  - Taking this information to the medical community
- Family members are being educated on circadian lighting
  - Many have asked when their loved one will receive the new lighting

Awesome outcomes!

“ACC will be incorporating many of the lighting solutions piloted in this project as best practices in terms of fall risk, sleep enhancement and non-pharmacological approaches for behaviors related to dementia.”

ACC Administrator

Thank you

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