



Light for Better Sleep

A Lighting Research Center study on lighting systems for Alzheimer's patients could help an aging population.

Residential Lighting: Tell us how light levels affect circadian rhythms. **Mariana G. Figueiro, Ph.D.:** Circadian rhythms are the rhythms in our body that repeat approximately every 24 hours. Light/dark patterns incident on the retina entrain our circadian rhythms to the 24-hour solar day. In the absence of this entraining stimuli, our circadian rhythms run with a period slightly greater than 24 hours. Light needed to activate the circadian rhythms is higher and "bluer" than that needed to activate the visual system.

The circadian system is also looking for contrast between light and dark, so constant light or darkness is also not recommended. This might be what is happening with Alzheimer's disease and related dementias (ADRD) patients, who tend to be in dim-light environments and constant-light environments. Increasing circadian light during the day and reducing it at night might be important for better sleep.

We studied an elderly population with sleep disturbances and one with ADRD. In both cases, light helped them entrain to the solar day and be more awake during the day and sleep better at night. While the study is ongoing, preliminary results show that exposure to daytime light that is brighter than the ones found in assisted-living facilities and nursing homes and look more "bluish-white" than an incandescent light source, with less light exposure during the evening hours, can help ADRD patients sleep better at night and reduce agitation during the daytime hours.



RL: What kind of light is needed?

MF: Daylight is an ideal light source for the circadian system. A light source with a correlated color temperature of 6500K or higher would be ideal for daytime, along with light levels at the eye of at least 600 lux. In the evening, the use of warmer light sources, such as a 2700K with no more than 50 to 80 lux at the eye, is recommended. We also suggest a night lighting system that provides a low level of warm color, with horizontal/vertical cues to help with postural control to minimize falls.

Lighting controls will play an important role because the daytime lighting system is different than the nighttime lighting system. In addition, personal sensors will become a key tool to allow for lighting schemes that promote entrainment at an individual level. Each person is different and responds to light differently. We need to be able to measure our circadian light/dark exposure and from that information design a lighting system that responds to our needs.

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RL: Do LEDs and CFLs run counter to what Alzheimer's patients need?

MF: Quite the contrary. These two light sources offer the possibility of using high correlated color temperature unlike incandescent lamps. Also, daylight can be energy-efficient and is a great light source for this application. In our study, we used GE Aquarium lamps that have a CCT of about 9200K.

RL: Is there more work to do?

MF: Yes. We have to start thinking about residential lighting that is coordinated with our work and school environments. In order to know when to add and remove circadian light to promote entrainment, we need to monitor our 24-hour light/dark exposures. In the case of older adults living in controlled environments, that task is easier. But for those of us who move from one building to another during the day, we need to monitor our light exposures and then have a system that can communicate with the sensors and feed information about the kind of lighting needed in the home. So the home environment will be a dynamic, individualized system that will respond to a person's overall light exposures.