Q&A for webinar Lighting University - Lighting for Visual Performance, Circadian Health and Safety in Older Adults.

January 25th 2018.

Q: In Japan the doctors already write to the elderly people light instead of Medicine.
I need more light solution- I am in Neuro Vision. Could you please advise?
A>>
I think the use of a robust light-dark patterns should be used either alone or in conjunction with medication. It is hard for me to state that light can be used instead of medication because it depends on the condition being addressed. But certainly, it can help if applied at the right time of day.

Q: On CS slide, did "daylight" and "incandescent" refer to CCT?
A>>
Although CCT is not the correct metric for the circadian system, it was used in the graph for demonstration purposes because people understand it. In that graph, it was the spectra of a 2656 K incandescent light source and the D65 fluorescent light source.

Q: Are there human models that are sophisticated enough to take a lighting design and predict the reduction of falls?
A>>
I am not aware of any,

Q: Could you please say about blue light hazard? Is it possible to have too much blue-enriched light during the day?
A>>
The blue light hazard has to do with dose (radiance and exposure time). I suggested a recent paper by my colleagues who evaluated that. As a ball park, we do not use anything that has a luminance level greater than the north sky.

Q: What is the difference between circadian light and CS?
A>>
The spectral irradiance at the cornea is used to determine circadian light (CL_A), which reflects the spectral sensitivity of the circadian system. CS is a transfer function that represents a measure of the *effectiveness* of the retinal light stimulus for the human circadian system from threshold (CS = 0.1) to saturation (CS = 0.7). CS equals the predicted percent melatonin suppression by a light source of certain irradiance and spectral power distribution.

Q: The previous slide mentioned CCT > 9000K, can you describe what you are using to get that CCT. Or how important that 9000K is ?
A>>
The use of the 9000K was simply because this was the only light source available that emitted higher amounts of short-wavelengths, allowing us to reduce the light level at the

eye from over 1000 lux to 300-400 lux. These were aquarium lamps that were available in the market at the time of the studies.

Q: How do you get seniors to sit around a light table for hours at a time? What is alternative would highlighting/washing a wall with light be a reasonable substitute??
A>>
I didn't get them to do it, the facility nurses did. This was standard practice in these facilities and we just adapted to what they were already doing. These patients stay in a common area, sitting around tables, where they do activities or simply sit there. It is strange to think that this is common practice, but it is. Anything that would increase light at the eye can be an appropriate substitute. But, remember, trying to get the light from highlighting walls may be more inneficient.

Q: How long the subject should be exposed to the light to say it is enough light every day? Every week? Because human body might not in one or two consequent day but catch up it in coming days.
A>>
For entranment, we need light every morning as we delay by about 12-15 min every day due to our longer than 24-h circadian clock. While the exact duration of exposure to maintian entrainment has not been systematically investigated, it has been shown that 30 min of bright (2500 lux of white light at the eye) light will help with seasonal depression symptoms. So, at a minimum, I would recommend 30 min, but in our studies, we are trying to use at least 2 h, to account for eyes closing and other things that might reduce the overall light exposure.

Q: Do you mean the exposition to 1136 +-89 lx during the day was given with a single light source? Or was it a source able to run from 6500K to 2700K?
A>>
No, they had ceiling lights and daylight. The used 4000 K fluorescent lamps plus windows.

Q: Do you consider that the widespread use of small digital devices (at close range and with brightness), more and more hours per day, can cause premature aging of the vision?
A>>
I am not aware of any systematic studies looking at premature aging of the eyes due to self-luminous displays.

Q: Are the methods to develop lighting prescriptions unique to an individual's needs?
A>>
We are working on a model of human circadian entrainment based on individual's light exposures. But to my knowledge, nothing has been developed yet.

Q: Aren't overall light levels proposed for night time (while awake) too low or dangerous for navigation of older adults in their living spaces? Renders shown seem to have very low light levels.
A>>
We have tested these light levels in the lab and showed that, compared to ceiling lights, there is a decrement in overall postural control and stability, but the low light levels with the perceptual cues restored it nicely. Light levels can be incresaed and still not distrub sleep. I recommend no more than 10 lux at the eye, which would be bright for nighttime applications (i.e., navigation).

Q: Have you compared CS to EML?
A>>
There is no way to compare these two metrics as they are measuring the same thing. EML is related to the response of 1 of the 5 photoreceptors involved in circadian photransduction and does not take into account the response by the circadian system. In other words, it is silent with respect to threshold and saturation. CS is a measure of the effectiveness of the light source spectra and amount from threshold to saturation. It is equivalent to acute melatonin suppression after 1 h exposure to that light source at that light level. CS predicts absolute biological response; EML does not. For more information, see the following references and short videos:

http://www.lrc.rpi.edu/programs/lightHealth/index.asp
http://www.lrc.rpi.edu/programs/lightHealth/publications.asp

Circadian Rhythms https://youtu.be/LFmEh0Q62Dc
Circadian Stimulus https://youtu.be/Cwq20f5PlVY

Q: Is there any mathematical predictive model to calculate the CS related to the duration time of exposing the subject to the light?
A>>
We are currently collecting data on duration of exposure and updating our model, so this will be available soon.

Q: Do you think that there is a more personal development of light treatment that would be more effective or do you just see it now as more universal?
A>>
Personal light treatments are the future. Right now, because we don't know enough about individual differences, the best we can do is use average responses. These work, but it would be more effective if we move more towards personal light exposures. Hopefully, with sensors and LED technology, this will be done soon.

Q: Does warm light at night bother them? Even if it is necessary for their circadian system?
A>>
I did not hear any complaints about the warm color light. These could be white light, just with a warm color and low light levels.

Q: Would it possible to elaborate a bit how daylight, windows and light can go hand in hand at home or nursery centre?
A>>
Dayilight is an ideal light source for the circaidan system, but needs to be integrated in the space in a way that it is received by the user without discomfort. Windows are a challenge because they can be glary and they can be covered. Pehaps the best way to introduc daylight into nursing homes would be to have skylights or courtyards or both.

Q: Do you have any comments to daylight treatment of SAD "Winter depression"?
A>>
The only problem is that typically, the sunrise in northern latitudes, where the prevalence of SAD is the highest, might be too late for entrainment of circadian rhythms. Therefore, while it is a good light source for the circadian system, it may not be available at the right time.

Q: What is the method to calculate CS? For every person, circadian stimulus must be different, right?
A>>
We have a calculator that allows you to calculate CS. The calculation is for a standard obesrver (average values), but you can select the macula pigment densitiy (which changes with individuals and age). So, until we know better about individual differences, the average values will give you a good idea of the effectiveness of light sources for the circadian system when calculating CS.

Q: Dear Mariana, is there already some APP available in the market connected or that makes use of your research?
A>>
I don't know of anything specifically but many manufacturers are starting to use CS in their catalogs and are making products available that are based on CS delivery.
Q: I have developed the LED lamp having 465 nm peak blue wavelength for neutral white and cool white. How do you see if it helps the circadian lighting?
A>>
Having the peak at 465 nm and no knowing what the rest of the emissions are makes it difficult to know its impact on the circadian system. I recommend you import your SPD to our calculator and determine, for various light levels, what the effectiveness is.

Q: Which one is better warm light or cool day light?
A>>
In a way, it doesn't matter. You can have an effect on the circadian system using both spectra. Light levels would have to be adjusted to account for the difference in spetrum.

Q: Could you please tell if the changing from blue bright (daylight) to a warmer orange (evening) is gradually and automatically changed by current Philips Technology applied? Do we have products that attend that demand?
A>>

We don’t need to have the gradual change, at least there is no evidence that this is needed to have a physiological effect, but it may be that people prefer that way and that there is a psychological benefit. I have not studied the psychological benefits of color changing.
I also don’t sell any products, so I don’t know the details of what is currently available.

Q: The lights that are used at night must be on all night? Doesn't this produce stimuli that can disturb sleep?
A>>
No, we have them on motion sensors so they are only on when patients are out of bed.

Q: Have you tested light flicker in helping Alzheimer?
A>>
No, we have not done this.

Q: I heard from a scientist that it's better to wake up with a warm light exposure instead of a cool light, to follow the natural sun cycle. What do you think about that?
A>>
The natural dawn had a lot of short-wavelength; we have done measurements on that, so the perception that it is red does not mean there is no short-wavelength light available.

Q: At what light level/ CCT did the circadian rhythm become affected?
Did the study show that LED street lighting levels could affect CR?
A>>
We did not see any impact of light on melatonin suppression with levels below 30 lux at the eye, irrespective of spectrum.

Q: Did any participants in the study have vision impairments such as AMD, and if so did their diagnosis and the dimming of light impact their function and sleep?
A>>
No, we have not worked with AMD patients.

Q: How did you measure/procedure the light at the eye level?
A>>
It depends on whether you are using a computer simulation program or are measuring it in the field. In a simulation program, you need to make sure that there are vertical points (at a certain distance from the workplane) representing light at eye level of a user. In the field, use a meter paralell to the face, near the eye level.