**Questions Log – AAH1603 webinar “Research to Practice: Lighting for Improved Environment of Care”**

Q: Are we as lighting designers getting into medicine by "prescribing" light levels (intensity and CCT) and making claims of its benefits?

A: [Mariana] Lighting designers have the obligation to provide the best possible design to their clients. This includes a more thorough understanding of the literature and the science, including the science on the light’s effects on circadian rhythms. Designers already “prescribe” lighting, so now the time has come to add one more design criteria to the design process, that is, how light affects our biological rhythms.

[Ed] As with specifying “healthy materials” designers need to recognize the limits of knowledge as design practitioners and not seek to prescribe solutions based upon claims of improving health. We can though point towards studies that illustrate benefits of specific light exposure and duration as well as the impact of spectral content. In the past, we largely chose lighting systems based upon market availability which was influenced by bias and preference fueled by past experience. We do not demand studies that illustrate a homogenously lit environment at 3000K is beneficial for anything more than facilitating the completion of tasks. With circadian impactful solutions, we look towards the natural solar patterns and the qualities of sky illumination for guidance and can have the greatest success when we bracket tunable solutions within that natural framework.

Q: Studies show that the blue light of LED inhibits sleep. This effect may not be improved by adjusting colors. Can you address this?

A: [Mariana] I am not sure I understand the question, but yes, short-wavelength light at night will suppress melatonin, delay sleep timing and help maintain alertness. So, narrowband, 470-nm light, for example, should be avoided at night. If using white light, changing spectrum for a 6500 K (more short wavelength light) to a 2700 K (less short wavelength light) may not be sufficient IF light levels are not reduced as well. So, changing CCT and not changing light level may not help with promoting sleep at night. But, remember, it is the 24-h light/dark patterns that matters: high levels during the day and low levels at night.

Q: Question for Dr. Figueiro: How was the CS 0.3 established, compared to 0.4 or higher values? Is there any paper published on this?

A: CS is a metric developed based on how the spectral power distribution and light level of a light source will affect acute melatonin suppression after 1 h exposure at night. It is used as a surrogate for how that light will impact the circadian system at night and during the day. Note that melatonin levels are low during the day, so there is no melatonin suppression during the day, but again, knowing how that light source would have impacted a marker of the clock (melatonin levels), will give you a clue as to how will impact the circadian system at any time of day. We have 4 papers published (3 with Alzheimer’s patients and one with Submariners) where we show that a CS of 0.3 is related to better sleep, mood and behavior and greater circadian entrainment to the watchstanding shift. These are listed in our website.

Q: What color light might be best for a nightlight?

A: Color and illumination levels play a roll. A very dim warm white light (less than 1 lux at the eye level) can provide enough light for safe mobility without impacting the non-visual systems. Amber lights at low level can be even better, but is not required. Any source, including LEDs can be used as long as the light levels are low.

Q: Has there been research into cultural differences in response to lighting? We imagine some "standard American" patient - but we know our patient population is quite diverse. How much cross-cultural investigation has been done to verify the research shown here across different populations?

A: [Mariana] There has been some, but not many. Studies have shown racial differences in internal biological clock timing and our own unpublished observation from our data is that Asian suppress less melatonin than Caucasians for the same stimulus. But, again, not much work has been done in this area.

Q: With tuneable lighting comes more complex control systems. I've found it challenging to convince clients to accept the added cost to project budget. This is in regards to corporate projects and even schools that typically have tight budgets. Also, the end user is also wary of being able to understand the control systems. They fear the time of having to change programming sometime after installation long after the design team is gone. Do you see tunable white being used in corporate projects? And how would you sway the client to pay for it and to not fear the control system?

A: This has been a challenge of tunable white systems for some time. Owners and designers appreciated the benefits that tunable systems could bring to the space, but these features often got “value-engineered” out of the project when the costs of tunable fixtures and sophisticated control systems got factored into the budget. Thankfully, manufacturers are beginning to address these legacy challenges through innovation and simplification of tunable systems. We now see 2- and 3-channel tunable systems being operated on control systems that were primarily used for intensity control (as opposed to more complex theatrical systems). These products aren’t theatrical systems that are being applied in commercial applications – they’ve been designed with the needs of these customers from the outset. User interfaces are also less complex – more suited for everyday users who want to control their settings in schools, offices, and hospitals through presets and plain language, or even better, online scheduling can enable users to “set and forget” controls scenes based on time-of-day or events. These features make the control system much more user-friendly on day 1, as well as day 1,001. And, yes, we are seeing tunable systems specified on corporate projects, particularly now that systems have become more mainstream and easier on constrained budgets.

This concern is not only one of tunable systems but can also be found in daylight and occupant controls as well as complex lighting scene selection. As these systems become more complicated, they are increasingly disabled or not used by occupants. The opportunity is to push lighting designers and electrical engineers to deeply consider the user interface and the value it brings to the project. The team can then forward the lessons to the owners. The question can then become, “How much control is absolutely necessary and how much can be run in the background with a lesser amount of user interface while still providing a successful solution?” We have also been successful in clearly stating within the specifications and construction documentation that there will be a recommissioning of the lighting system 6 months after operations have begun. This keeps the design team engaged in process, allows for the addition of institutional knowledge, and comforts the client by ensuring that they will not be left to handle potential costly problems on their own.

Q: Has CHOP begun to look at darker radiology procedure areas like Cath/IR or any staff reading / monitoring command rooms?

A: [Mary] Yes, our internal CHOP Design Guidelines call for dimming in all Radiology Procedure rooms, and Reading Rooms, with all dimming to be to 1%. User flexibility is also key especially in Radiology Reading rooms, giving each individual station individual dimming control.

Q: Lighting control systems become an integral part of these solution. Previous systems have been difficult to maintain and modify for most facilities. Have there been significant improvements in these systems in recent years?

A: [Same answer as above, related to tunable lighting and controls systems.]

Q: Thank you for the information! What is a good resource to find out about lighting options/solutions/manufacturers? Is there a central portal/magazine (such as Healthcare Design)?

A: Thank you for your interest in lighting. We are glad to welcome more lighting enthusiasts to our ranks! There are several very good lighting publications that offer well-written editorial content, as well as useful information related to current technologies and solutions from leading manufacturers. One such publication is *LD+A*, which is the official magazine of the Illuminating Engineering Society of North America. In fact, three of the panelists in the webinar contributed articles for the *LD+A*’s Light & Health issue, which went to press this month (October 2016). Additionally, the design-oriented *Architectural Lighting Magazine* ([www.archlighting.com](http://www.archlighting.com)) also offers excellent industry news and profiles innovative architectural lighting projects from around the globe.