

121 APR/MAY 2021
www.arc-magazine.com

arc

LIGHTING IN ARCHITECTURE

Green Light

Light Collab breathes new life to
Singapore's Parkroyal Collection Marina Bay

LAM PARTNERS 60TH ANNIVERSARY • QISTINA AHMAD ALI
HOSPITALITY FOCUS • DARK SOURCE FINALE • LED LINEAR ULTIMA-P REVIEWED • CASAMBI AWARDS

Three Principles for Healthy Living with Light and Lighting

Amidst the growing awareness of the importance of light and darkness for human health, Asst. Prof. Dr. Karolina Zielinska-Dabkowska and Dr. Ruth Kelly Waskett offer some key advice on how the lighting industry can respond.



The lockdown measures applied to cities and towns during the worldwide Covid-19 pandemic have had a widespread impact on people's lives. Some have found themselves confined to their homes, with limited social contact and a reduced quality of life. Others have found that the lockdown improved their

wellbeing, as more time was spent outside, instead of commuting and working in an office building, plus the benefits of spending increased quality time with loved ones.

The pandemic raised public consciousness about the need to take control of our own wellbeing and health: in particular, to take greater care of immunity. There was also concern about the consequences of extended time spent in indoor spaces, which can create mental fatigue that can manifest itself in a number of ways, including reduced productivity, lack of concentration and in some cases, depression. Many people soon realised the simple things in life that had previously been taken for granted, such as access to daylight and contact with nature, play a vital role in mental health and wellbeing. Research in the past two decades has led us to a key moment, where we have a growing body of knowledge about (a) how important daylight exposure is for human health and (b) how damaging electric light exposure at night can be to humans and ecology. It's now time to put this together and return to the bright day and dark night cycle that evolution engraved in us.

In the developed world, it is recognised that sleep problems connected to increased light exposure at night are associated with exacerbating existing illnesses and many prevalent diseases. Of great concern is the fact that poor and insufficient sleep has increased significantly in children and adults. Technology, diet and low activity levels are undoubtedly to blame for this, but light is the thread that runs through all of them. During the daytime, not enough time spent outside results in not just low activity levels but also greatly reduced light exposure. At night, interaction with indoor lighting and digital technology leads to an excess of sensory stimuli and light exposure, leading to excess cognitive activity and disrupted hormonal balance before bed.

By and large, people have control over the lighting in their own homes, so it makes sense for lighting professionals to help them make their home lighting environment healthier. The three principles of Healthy Living with Light and Lighting, as introduced here, should support this quest.

What Next?

Lighting practitioners, manufacturers and researchers have an obligation to focus on how to facilitate the recommendations outlined here. We also have a responsibility to help people make healthier choices with light, in the same way that the food industry has a responsibility to help people make healthier choices with food. After many years of campaigning and government policy development, food products must now be labelled with calorie content and nutritional information. Armed with the scientific evidence and knowledge we now have about the impact of light upon human health, it seems logical that lighting products should also provide helpful guidance for consumers. In addition to lumen output, this should include spectral information (SPD), as well as colour rendering index (CRI), correlated colour temperature (CCT) and flicker metrics. Finally, the right to access daylight, coupled with the promotion of healthier light sources in the evening, needs to be implemented into government policies. ■



Dr. Ruth Kelly Waskett, Associate, Hoare Lea



Asst. Prof. Dr. Karolina Zielinska-Dabkowska, designs4people/GUT

Three Principles of Healthy Living with Light and Lighting

Day



Bright light

- During the day, try to get exposure to daylight on your face/eyes before 10am, without wearing sunglasses or a hat, to activate your biological clock. This could be achieved by walking outside for a minimum of 30 minutes. Keep in mind that exposure to daylight in the morning will have a direct impact on your quality of sleep at night.
- Short-sightedness (myopia) has been linked with a lack of exposure to daylight and time spent outdoors. Exposure to outdoor daylight can also reduce the symptoms of Seasonal Affective Disorder (SAD).
- As low vitamin D status can be associated with an increased risk of Covid-19 infection, from late spring to early autumn, try to gradually increase your skin exposure to direct sunlight for 5-10 minutes each day to produce vitamin D. Note that at high latitudes in winter, it is not possible to produce vitamin D from sun exposure, therefore supplementation with vitamin D3 is necessary.
- In indoor spaces, try to rely on daylight as much as possible, and position your desk next to the window, preferably with a view out, especially when you have to work long hours. If daylight is unavailable, use electric lighting that provides a continuous spectrum of light with a high blue wavelength content, to mimic aspects of the spectral composition of daylight.

Evening



Less Light

- During the evening at home, use lighting with a warm colour appearance at night and a Correlated Colour Temperature (CCT) below 3000K. Allow for a mixture of ambient and focal lighting, ideally with a continuous light spectrum and very little to zero blue wavelengths of light. Use dimming to lower light levels and create a relaxing atmosphere.
- Use LED light sources with continuous light spectrum, rather than compact fluorescent lamps (CFLs).
- Blue light from electronic devices can suppress the production of melatonin and adversely impact your sleep. This is particularly important in children, for whom sleep disturbances can severely impair and reduce the production of growth hormone, and hinder memory function. It is the interaction with technology, however, that matters most. Avoid using mobile devices such as mobile phones or tablets for two hours before bedtime. If available, features such as “night shift”, which reduce the blue energy content of the light emitted from a device screen, can be used. Such features, however, do not completely reduce the blue wavelengths of light, so will not completely mitigate the impact of such devices.

Night



No Light

- Sleep should take place in complete darkness, preferably with no electric lighting. If any light trespass from street lighting is present in the bedroom, use blackout curtains or window shutters, or wear an eye mask to minimise it.
- The National Sleep Foundation (NSF) recommends that the best time for getting ready for bed is between 8pm to 12am. The hours of sleep before midnight have been shown to benefit organ function.
- If you need to use the bathroom during the night, use yellow, amber or even a red coloured light source with zero blue wavelengths of light in the spectrum, and ensure the light source emits diffused, low levels of light.
- Try to get at least seven hours of undisturbed sleep. REM sleep phases last around 90 minutes, meaning four full sleep phases. Good quality sleep is particularly vital during illness, because the regeneration and repair of cells occurs during sleep. Sleep also boosts the body's metabolic rate to facilitate weight loss, and several studies have linked exposure to artificial light at night to weight gain and obesity.

References

- Argys, L.M.; Averett, S.L.; Yang, M. *Light pollution, sleep deprivation, and infant health at birth*, *Southern Economic Journal* 2021, 87, 3, pp 849-888. <https://doi.org/10.1002/soej.12477>
- Brown, T. et al. *Recommendations for Healthy Daytime, Evening, and Night-Time Indoor Light Exposure*. Preprints 2020, 2020120037 <https://doi.org/10.20944/preprints202012.0037.v1>
- *Changing perspectives on daylight: Science, technology, and culture*. Science/The American Association for the Advancement of Science, Custom Publishing Office Washington, DC, 2017. <https://bit.ly/3cH8esd>
- Commission Internationale de l'Éclairage (CIE). *CIE Position Statement on Non-Visual Effects of Light. Recommending proper light at the proper time*, 2nd ed., CIE Publication: Vienna, Austria, 2019; Available online: <https://bit.ly/2NysTq0> (accessed on 17 March 2021).
- Graw, P. et al. *Winter and summer outdoor light exposure in women with and without seasonal affective disorder*. *Journal of affective disorders* 1999, 56, 2-3, 163-169. [https://doi.org/10.1016/S0165-0327\(99\)00037-3](https://doi.org/10.1016/S0165-0327(99)00037-3)
- Grubisic, M. et al. *Light pollution, circadian photoreception, and melatonin in vertebrates*. *Sustainability* 2019, 11, 6400. <https://doi.org/10.3390/su11226400>
- Lagrèze, W. A.; Schaeffel, F. *Dtsch Arztebl Int.* 2017, 114, 575-580. <https://doi.org/10.3238/arztebl.2017.0575>
- Liu, N. et al. *Low vitamin D status is associated with coronavirus disease 2019 outcomes: a systematic review and meta-analysis*, *International Journal of Infectious Disease* 2021, 104, 58-64. <https://doi.org/10.1016/j.ijid.2020.12.077>
- McAlpine, C.S., Kiss, M.G., Rattik, S. et al. *Sleep modulates haematopoiesis and protects against atherosclerosis*. *Nature* 2019, 566, pp.383-387. <https://doi.org/10.1038/s41586-019-0948-2>
- Münch, M. et al. *The Role of Daylight for Humans: Gaps in Current Knowledge*. *Clocks & Sleep*. 2020, 2, 61-85. <https://doi.org/10.3390/clocksleep2010008>
- Park, Y.M.M. et al. *Association of exposure to artificial light at night while sleeping with risk of obesity in women*. *JAMA Intern Med*; 2019, 179(8), pp.1061-1071. <https://doi.org/10.1001/jamainternmed.2019.0571>
- Wright, K.P. et al. *Entrainment of the human circadian clock to the natural light-dark cycle*. *Curr Biol*. 2013, 23, 16, 1554-1558. <https://doi.org/10.1016/j.cub.2013.06.039>
- Zielinska-Dabkowska, K.M.; Xavia, K. *Protect our right to light*. *Nature* 2019, 568, 451-453. <https://doi.org/10.1038/d41586-019-01238-y>
- Zielinska-Dabkowska, K.M. *Make lighting healthier*. *Nature* 2018, 553, 274-276. <https://doi.org/10.1038/d41586-018-00568-7>
- Zielinska-Dabkowska, K.M. *Vitamin D. The truth about Vitamin D and sun exposure demystified. Finding the balance for personal health*. Professional Lighting Design 2014, 93, 40-48. <http://bit.ly/394q9rJ>
- Zielinska-Dabkowska, K.M.; Rohde, M.F. (Eds.) *New Perspectives on the Future of Healthy Light and Lighting in Daily Life.*, 1st ed.; callidus. Verlag wissenschaftlicher Publikationen.: Wismar, Germany, 2017; ISBN 978-3-940677-61-7 <https://bit.ly/3bWg5Dh>
- Zielinska-Dabkowska K.M. *Home Sweet Home. Connecting the dots for healthy evening residential illumination*. *arc magazine* 2019, 111, pp.055-060. ISSN 1753-5875 <http://bit.ly/30TqCss>