

THE BENEFITS OF DAYLIGHTING IN ARCHITECTURAL DESIGN

The Impact of Effective Daylight Integration on Building Occupants' Health and Performance

Sustainable design and occupant well-being are increasingly intertwined in the built environment. Daylighting – the intentional integration of natural daylight into building interiors as the reliable primary daytime source of illumination – is a key design strategy to meet both requirements. More than just an aesthetic choice, access to daylight has profound implications for human health and performance, especially as most of us spend 80–90% of our lifetime indoors¹. Scientific research continues to uncover how the relationship between natural daylight and human physiology helps to improve mood, cognitive function, and overall well-being.

The Science Behind Daylighting

Human beings are evolutionarily adapted to the rhythms of natural daylight. Light exposure strongly influences our circadian rhythms – biological processes that follow a roughly 24-hour cycle – as natural daylight varies in intensity and spectral composition throughout the day. These variations play a critical role in instructing our bodies on how to regulate our sleep-wake cycle, hormone and neurotransmitter production, and even body temperature.

Research has shown that exposure to natural daylight in the morning helps reset the circadian clock for daytime physiological activity, enhancing alertness, and overall productivity and performance throughout the day². For example, a study published in [Building and Environment](#) showed that working in environments with abundant natural daylight not only improves occupant satisfaction but also helps cognitive function³.





Let's take a closer look at the ways in which daylight affects human health...

Health Benefits of Daylighting

1. Improved Sleep Quality and Circadian Regulation

As mentioned above, natural light is a powerful synchronizer of the body's internal clock. Access to daylight throughout the day can help to suppress melatonin production – the hormone that signals sleep onset – and stimulate the production of serotonin during daytime hours, leading to a more robust and natural sleep-wake cycle. A study by Figueiro et al. (2017) found that office workers with greater exposure to natural daylight during the day reported better sleep quality at night and lower levels of depression⁴. Further research conducted in the US and South Korea (2020) revealed that exposure to a large amount of daylight in a workspace increased sleep time and efficiency, as well as quality of life⁵.

What's more, in the healthcare sector, a study based on 15 years of medical data found that hospital patients with beds next to a window had shorter hospital stays than those with beds located by doors, potentially because they were sleeping better⁶.

Conversely, the lack of daylight experienced by shift workers has been shown to disrupt circadian rhythm and cause health problems, making thoughtful physiologically meaningful lighting design even more critical⁷. It's proven that by integrating daylight into the built environment, architects and designers can provide interior spaces that promote healthier sleep patterns and make a positive contribution to the physical wellbeing of building occupants in all types of buildings.

Effective
daylighting
design not
only benefits
physical health
but plays a
significant
role in mental
and emotional
health.

2. Enhanced Mood and Reduced Stress

Effective Daylighting design has also been linked to improved mood and reduced levels of stress. Natural daylight has been shown to increase serotonin levels, contributing to improved mood and higher overall emotional well-being.

Since the COVID-19 pandemic and a rise in remote working, more and more people are spending much of their day at home. A study from 2022 demonstrated that the daylighting design of homes has a significant impact on subjective emotional wellbeing, with the most positive impact coming from maximizing the amount of daylight entering the home. It found that increased space between dwellings and larger, sun-facing windows also improved wellbeing. The biggest beneficiaries of natural daylight conditions in the home were women and young people⁸.

According to a recent literature review, direct sunlight in the room, determined by the window's orientation, appears to be the most effective daylight-affecting factor for restorative effects. Sunnier and brighter environments appear to give the best results, followed by the proximity of the occupant to daylight or a sunny patch⁹. These findings suggest that effective daylighting design not only benefits physical health but plays a significant role in mental and emotional health.

3. Increased Productivity and Cognitive Performance

In environments such as offices and educational institutions, productivity and performance are key success metrics. Research has consistently found that natural daylight exposure, with its meaningfully dynamic nature, correlates with improved cognitive performance. A landmark study published in the Journal of Clinical Sleep Medicine showed that workers with access to natural daylight experienced a 10-15% increase in productivity, attributed to enhanced concentration and reduced fatigue¹⁰. Effective Daylighting design has also been associated with improved memory retention and faster reaction times, making it a factor in optimizing work and learning environments.

Challenges and Future Directions

While the benefits of effective daylighting design are clear, seasonal variations and geographic location can limit the availability of natural daylight, especially in regions with long winters or persistent cloud cover. Concerns about overheating and glare must also be addressed through smart, climate-responsive design and material innovations, such as the use of high diffusion glazing and spectrally selective coatings that minimize heat gain to the occupied spaces.



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Our understanding of the relationship between natural daylight and human health is growing thanks to emerging research examining how time-dependent exposure to different wavelengths of light affect mood and cognitive performance, as well as the potential benefits of personalized lighting systems that replicate natural daytime light patterns and spectral content throughout the day to alleviate seasonal deficiencies in meaningful daylight exposure.

As this knowledge evolves, so does the potential for designing spaces that conserve energy and promote occupants' health and well-being, making a compelling case for considering daylighting strategies from the earliest design stages to ensure brighter, healthier, more productive spaces aligned with our innate biological needs. Retrofitting existing spaces with daylighting strategies also presents a valuable opportunity to enhance occupant well-being in built environments.

Many existing structures can be improved to better integrate natural daylight, thereby reaping the benefits of improved health and productivity. This approach not only maximizes the use of existing resources but also aligns with sustainable design principles by reducing the need for artificial lighting and energy consumption.

¹Klepsis N, Nelson W, Ott W. et al. The National Human Activity Pattern Survey (NHAPS): a resource for assessing exposure to environmental pollutants. *J Expo Sci Environ Epidemiol* 11, 231–252 (2001). <https://doi.org/10.1038/sj.jea.7500165>

²Blume C, Garbazza C, Spitschan M. Effects of light on human circadian rhythms, sleep and mood. *Somnologie (Berl)*. 2019;23(3): 147–156. <https://pubmed.ncbi.nlm.nih.gov/31534436/>

³Jamrozik A, Clements N, Hasan SS, Zhao J, Zhang R, Campanella C, Loftness V, Porter P, Ly S., Wang S, Bauer B. Access to daylight and view in an office improves cognitive performance and satisfaction and reduces eyestrain: A controlled crossover study. *Building and Environment*. 2019;165,106379. <https://doi.org/10.1016/j.buildenv.2019.106379>

⁴Figueiro MG, Steverson B, Heerwagen J, et al. The impact of daytime light exposures on sleep and mood in office workers. *Sleep Health*. 2017;3(3):204–215. <https://pubmed.ncbi.nlm.nih.gov/28526259/>

⁵Lee J, Boubekri M. Impact of Daylight Exposure on Health, Well-being and Sleep of Office Workers Based on Actigraphy, Surveys, and Computer Simulation. *Journal of Green Building* 1 September 2020; 15 (4): 19–42. <https://doi.org/10.3992/jgb.15.4.19>

⁶Park MY, Chai CG, Lee HK, Moon H, Noh JS. The Effects of Natural Daylight on Length of Hospital Stay. *Environ Health Insights*. 2018;12:1178630218812817. Published 2018 Dec 3. <https://pubmed.ncbi.nlm.nih.gov/30546262/>

⁷Nie J, Zhou T, Chen Z. et al. The effects of dynamic daylight-like light on the rhythm, cognition, and mood of irregular shift workers in closed environment. *Sci Rep* 11, 13059 (2021). <https://doi.org/10.1038/s41598-021-92438-y>

⁸Morales-Bravo J, Navarrete-Hernandez P. Enlightening wellbeing in the home: The impact of natural light design on perceived happiness and sadness in residential spaces. *Building and Environment*. 2022;223 (109317). <https://doi.org/10.1016/j.buildenv.2022.109317>

⁹Karaman Madan O, Chamilothon K, van Duijnhoven J, Aarts MPJ, de Kort AW. Restorative effects of daylight in indoor environments –A systematic literature review. *Journal of Environmental Psychology*. 2024;97(102323). <https://doi.org/10.1016/j.jenvp.2024.102323>

¹⁰Boubekri M, Cheung IN, Reid KJ, Wang CH, Zee PC. Impact of windows and daylight exposure on overall health and sleep quality of office workers: a case-control pilot study. *J Clin Sleep Med*. 2014;10(6):603–611. Published 2014 Jun 15. <https://pubmed.ncbi.nlm.nih.gov/24932139/>

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