

Title:

Bringing light to prison design

Submission (600 words)

This paper explores the largely uncharted territory of how lighting conditions influence the psychological responses of people within prison settings. It emphasises the crucial role of prison architects in designing places to enhance rather than compromise the physical and mental health of both people in prison and prison staff. While environmental psychology has long established the impact of environmental stimuli on cognition<sup>1</sup>, mood<sup>2,3</sup>, and behaviour<sup>4,5</sup>, there is an emerging and expanding body of research highlighting the significance of light. The discovery in 2002 of a third photoreceptor in the retina marked a pivotal moment in the study of non-visual effects of light<sup>6</sup>, leading to an increased academic interest in understanding how light triggers psycho-biological responses in humans. While the effects of light on mood and interactions in various work and healthcare settings have been extensively studied, the prison environment remains a significant gap in our understanding.

The paper delves into the fundamentals of light, detailing its composition as a part of electromagnetic radiation and emphasising the importance of the visible spectrum, especially blue light, in regulating circadian rhythms. Notably, the intrinsic photoreceptive retinal ganglion cell, containing the photopigment melanopsin, plays a crucial role in non-visual processes, impacting melatonin production, body temperature, cortisol production, and alertness<sup>7</sup>.

Existing studies demonstrate the positive outcomes of appropriate lighting conditions in hospitals, schools, and care homes researches<sup>8,9,10,11</sup>, prompting an investigation into how such principles can be applied to prison design. Prisons, characterised by oppressive environments, present unique challenges in terms of inmate behaviour, with high levels of anxiety, stress, and hostility often attributed to the loss of well-being.

Examining lighting norms in prison design across different regions, the author notes variations in recommended illuminance levels as the only parameter of quality of light, with no consideration of the characteristics of the emitted light, emphasizing the need for more comprehensive guidelines. The discussion extends to a critical review of lighting fixtures and window design in prisons, highlighting the prevalent use of artificial lighting and inadequacies in daylight exposure. Empirical data from a Chilean prison reinforces the notion that even modern prisons may not meet the minimum daylight requirements for inmates.

Drawing from studies on the relationship between lighting conditions and mental health in prisons, the paper discusses the prevalence of sleep disorders, depression, and aggression among inmates. The potential correlation between lighting conditions and the rising trend of self-inflicted deaths in prisons is explored, shedding light on the critical need for improvements in indoor lighting.

The concluding section underscores the importance of lighting in impacting behavioural outcomes in prisons. The research suggests that proper exposure to specific wavelengths of light, notably blue light, can positively influence melatonin secretion, regulate circadian rhythms, and contribute to improved psychological responses. As prisons face increasing scrutiny for mental health challenges among inmates, this paper advocates for a re-evaluation of lighting conditions as a crucial component of prison design and management, aiming to foster better inmate well-being and rehabilitation outcomes.

#### References:

1. Babin, B.J., Hardesty, D.M. & Suter, T. a, 2003. Color and shopping intentions. *Journal of Business Research*, 56(7), pp.541–551. Available at: <http://linkinghub.elsevier.com/retrieve/pii/S0148296301002466> [Accessed December 3, 2014].
2. Knez, I., 2001. Effects of Colour of Light on Nonvisual Psychological Processes. *Journal of Environmental Psychology*, 21(2), pp.201–208. Available at: <http://linkinghub.elsevier.com/retrieve/pii/S0272494400901981> [Accessed February 8, 2015].
3. Hoffmann, G. et al., 2008. Effects of variable lighting intensities and colour temperatures on sulphatoxymelatonin and subjective mood in an experimental office workplace. *Applied ergonomics*, 39(6), pp.719–28. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/18164275> [Accessed November 7, 2014].
4. Jalil, N.A., Yunus, R.M. & Said, N.S., 2012. Environmental Colour Impact upon Human Behaviour: A Review. *Procedia - Social and Behavioral Sciences*, 35(December 2011), pp.54–62. Available at: <http://linkinghub.elsevier.com/retrieve/pii/S1877042812003746> [Accessed December 4, 2014].
5. Webb, A.R., 2006. Considerations for lighting in the built environment: Non-visual effects of light. *Energy and Buildings*, 38, pp.721–727.
6. Berson, D. and D.F. and M.T., Dunn, F. & Takao, M., 2002. Phototransduction by retinal ganglion cells that set the circadian clock - ProQuest. *Science*, 295, pp.1070–1073. Available at: <http://search.proquest.com/docview/213596922/fulltextPDF?accountid=13828> [Accessed November 24, 2014].
7. Braun, M. et al., 2009. Human factors in lighting. In *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*. pp. 223–230.
8. Wong, J.K.-W. et al., 2014. The effects of the indoor environment of residential care homes on dementia sufferers in Hong Kong: A critical incident technique approach. *Building and Environment*, 73, pp.32–39. Available at:

<http://linkinghub.elsevier.com/retrieve/pii/S0360132313003478> [Accessed December 4, 2014].

9. Bailey, M. & Silver, R., 2014. Sex differences in circadian timing systems: implications for disease. *Frontiers in neuroendocrinology*, 35(1), pp.111–39. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/24287074> [Accessed December 4, 2014].
10. Figueiro, M.G. et al., 2014. Tailored lighting intervention improves measures of sleep , depression , and agitation in persons with Alzheimer ' s disease and related dementia living in long-term care facilities. *Dovepress*, 9, pp.1527–1537.
11. Sansal, K.E., Edes, B.Z. & Binatli, A.O., 2008. Effects of Indoor Lighting on Depression Probability and Academic Performance in a Population of Turkish Adolescents. In *Experiencing Light 2012*. pp. 1–4. Available at: <http://2012.experiencinglight.nl/orals.html>.