# ASHBi SEMINAR

# Light-intensity coding in the human prefrontal cortex


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**Date** Tuesday, 18 July 2023

**Time** 17:00 – 18:00 [JST]

**Venue** Conference Room
B1F, Faculty of Medicine Bldg. B
*Register via the right QR code


**Abstract**

Light intensity affects mood and cognition in humans and experimental animals, and a distinctive component of retinal output encodes absolute light intensity in the visual environment. This pathway derives largely from melanopsin-expressing intrinsically photosensitive retinal ganglion cells (ipRGCs). These cells innervate multiple subcortical targets and drive diverse physiological effects of light including circadian entrainment, pupillary reflexes, neuroendocrine and sleep modulation, along with retinal and visual brain development. A relatively direct pathway to the medial frontal cortex in mice appears to mediate depression-like symptoms. Using functional magnetic resonance imaging, we have now determined that regions in the human prefrontal cortex code light intensity, and that these regions appear to operate independently of occipital regions that also have light intensity sensitivity. Furthermore, the response properties of the prefrontal regions have similarity to physiological responses of ipRGCs, suggesting that the photic information to the prefrontal cortex that codes mood has independence from the retinal-geniculate-striatal pathway. Since some of the prefrontal regions having light intensity sensitivity overlap with regions implicated in depression, we also examined whether seasonal-affective disorder and major depressive disorder modified prefrontal responses to different illumination levels. While people with depression exhibited light intensity coding in the prefrontal cortex, we did find a region in the inferior frontal cortex with differential light intensity coding between healthy controls and depressed patients. From these experiments, we have provided evidence that supports the use of light therapy for depression disorders.


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