Impact of Self-Luminous Tablet Displays on Evening Melatonin Levels

Self-luminous electronic devices emit optical radiation at short wavelengths, close to the peak sensitivity of melatonin suppression. Suppression of melatonin by light at night has been implicated in circadian sleep disorders.

Methods

LRC researchers tested the effects of self-luminous tablets, at full brightness, on melatonin suppression. In order to simulate typical usage of these devices, 13 individuals used tablets to read, play games, and watch movies. Participants experienced three experimental conditions:

- They viewed their tablets through a pair of clear goggles fitted with 470-nm (blue) light from LEDs. This was a "true positive" condition because the blue light is known to be a strong stimulus for suppressing melatonin.
- They viewed their tablets through orange-tinted glasses, capable of filtering out the short-wavelength radiation that can suppress melatonin; this was the "dark control" condition.
- They did not wear glasses or goggles.

In order to accurately record personal light exposures during the experiment, each subject wore a Dimesimeter, a small calibrated light meter device developed by the LRC that continuously records circadian light and activity levels.

Subjects viewed self-luminous tablets without eye filters, with orange-tinted glasses, and with blue-light (LED) goggles.

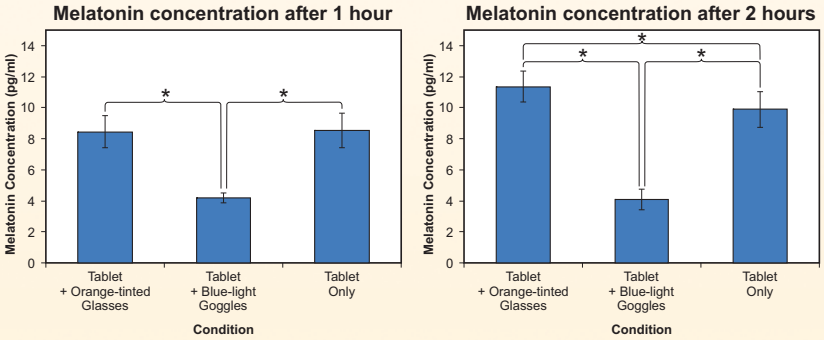
Results

Compared to the "dark control" condition, melatonin levels after one-hour exposure to the tablet was not significantly affected. However, two-hour exposure to light from the tablets significantly reduced melatinin levels compared to the "dark control" condition.

Melatonin suppression values after 60 minutes were very similar to those estimated using a predictive model of human circadian phototransduction.

Conclusions

Melatonin levels are affected by duration of exposure and the distance between the eye and the display, which determines the amount of light reaching the back of the eye. These results, together with the LRC predictive model of human circadian phototransduction, could urge manufacturers to design "circadian-friendly" electronic devices that could either increase or decrease circadian stimulation depending on the time of day—increasing in the morning to promote alertness, and reducing in the evening for a better night's sleep.



Significantly ($p < 0.05$) lower melatonin levels for tablet + blue light and tablet only compared to tablet + orange-tinted glasses after 2 hours, but melatonin levels for tablet only after 1 hour were not significantly lower than tablet + orange-tinted glasses. Predicted suppression and actual (median) = 3%.

Publication

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