

Mind Read

Connecting brain and behavior



June 07, 2013 | By: [Dana Smith](#)

What's Keeping You Awake at Night?



There's nothing worse than not being able to fall asleep at night. You toss and turn, fluffing one pillow and then another. Blankets on, blankets off. Window open, window closed. Nothing seems to be right. Thoughts about the previous day and the impending dawn tumble through your head, swirling around, popping up, flitting away - teasing you and flirting with your subconscious.

Exasperated, you give up on sleep and open up your laptop to check Facebook, or pull up the latest round of Candy Crush on your phone, hoping the mind-numbing scrolling will finally hypnotize you into sleep.

But what if these LED screens are exactly what's keeping you awake?

Several articles have reported on the effects of LED backlit screens and their emission of a certain blue-light wavelength on melatonin levels, an essential hormone that makes you drowsy and kicks in your sleep cycle. Melatonin is released naturally at the onset of darkness, preparing your body for rest, and then continuously throughout the night as part of your natural circadian rhythm - your body's daily biological clock. However, melatonin can be partially curbed by exposure to light, and the abnormally bright glow of backlit computer screens seems to be especially disruptive to its release. Suppression of melatonin then has the opposite effects, increasing alertness and arousal, and even altering REM sleep patterns when you finally do nod off.

To test this phenomenon, researchers measured melatonin levels in college students after having them sit in front of either an LED backlit or non-LED computer screen at night for a number of hours (1). Although melatonin did rise naturally over the course of the experiment in all participants, it rose much less steeply and with a delay in those exposed to the LED screens. EEG recordings of brain activity in the frontal cortex indicating slow-wave sleep patterns were also suppressed in the LED-viewing participants. Curiously though, self-reports of sleepiness increased throughout the night in both groups (not surprising), but did not differ between the two screen groups. Thus, even though the LED group had lower melatonin levels, indicating they might have more difficulty falling asleep, they did not *feel* any more awake. However, researchers also had participants complete a series of attention and memory tasks during the study on their respective computers, on which the LED group performed significantly better, presumably reflecting their increased alertness and arousal, despite not objectively experiencing it.



In a similar study, a separate group of researchers sat students down in front of an LED screen from the hours of 11pm-1am (not too unusual an occurrence), but this time they also equipped them with specialized goggles that either ramped up or down the amount of blue light they received (2). Melatonin levels were reduced by almost 50% in the blue goggle condition, which amplified the target blue-light wavelength, but were down only 7% in the pure LED condition after two hours of exposure, and not at all after one hour. Thus, it seems the brightness of the light and the length of time spent staring at it significantly affects the impact on melatonin levels.

But maybe it's not the screen you're looking at itself; maybe it's what's on the screen that's the problem. Several studies have reported an increase in stress levels induced by late-night texting, which can trigger insomnia and disrupt sleep patterns. A preliminary study from University of Texas Pan-American reported [higher stress levels and poorer sleep](#) in students who texted or went online within two hours before going to bed. [Another report](#) stated similar findings when it came to active screen behaviors, like emailing or playing a video game, but no difficulties in those who just watched a movie on their laptops. Thus, the problem may be more linked to the type of activity you use your computer for, with active screen behaviors causing higher arousal rates before bed.

Either way, when it comes to your night-time routine, you might do better with the age-old adage of reading a boring book or counting sheep to help you fall asleep instead of checking your email one last time.

Cajochen C. *et al.* [Evening exposure to a light-emitting diodes \(LED\)-backlit computer screen affects circadian physiology and cognitive performance](#). *Journal of Applied Physiology* **110**, 1432-1438 (2011).

Wood B. *et al.* [Light level and duration of exposure determine the impact of self-luminous tablets on melatonin suppression](#). *Applied Ergonomics* **44**, 237-240 (2012).

Image credit: [RelaxingMusic](#) and [TimSnell](#) (via Flickr).

5 Comments

COMMENTS

June 16, 2013 | 04:35 PM

Posted By: [Dana Smith](#)

That's a great point about the melatonin supplements. I haven't seen much research on how effective they are, and I don't know of any particular studies about off-setting the screen effects with them. I do know that tryptophan supplements (a melatonin precursor) don't seem to be very effective, though. A better option might be to reduce or change the screen resolution, or of course just to turn off!

June 15, 2013 | 01:23 AM

Posted By: [Bruce Braun](#)

With so many people constantly looking at screens, it's no wonder that we modern folk having problems falling asleep. I wonder if this can be counteracted by taking over-the-counter melatonin supplements? What? Quit the laptop/cell phone earlier instead...?

June 07, 2013 | 04:46 PM

Posted By: [Khalil A. Cassimally](#)

Ilona, yep, I wasn't implying that there it's a cause-and-effect. But perhaps an over-stimulation is one of the factors that can lead to tumours? I've read something along those lines somewhere... but perhaps I'm completely off-target...

June 07, 2013 | 04:27 PM

Posted By: [Ilona Miko](#)

Whoa there KAC. LED backlight isn't giving people any tumors in pineal gland or anywhere else. Brain stimulation and arousal is dependent on so many things, all affecting catecholamine balance. Now go eat some fish, drink some milk, and then wash down a few cicadas with some coffee. Deeeelish.

June 07, 2013 | 01:18 PM

Posted By: [Khalil A. Cassimally](#)

The most frightening thing about staring at LED backlit screens before going to sleep is that it may over-stimulate the pineal gland to produce melatonin. This over-stimulation can cause problems, including---correct me if I'm wrong here---tumours.



