Effects of Red and Blue Light on Alertness, Sleepiness, and Mood

The impact of color on mood and alertness is controversial, at least in part because of the confusion between three distinct domains: physical, physiological and psychological. Optical radiation reaching the retina has multiple effects on the brain via parallel neural pathways, so determining the underlying mechanisms contributing to light-induced mood and alertness is difficult.

The LRC set out to explore the roles that long-wavelength (red) and short-wavelength (blue) lights have on subjective and objective measures of alertness, sleepiness, and mood at night. The stimuli were chosen to have differential effects on the circadian system, known to be highly sensitive to short-wavelength radiation and insensitive to long-wavelength radiation. If blue but not red light had an impact on mood and alertness, then there would be support for the inference that these measures can be affected only by light through the circadian system.

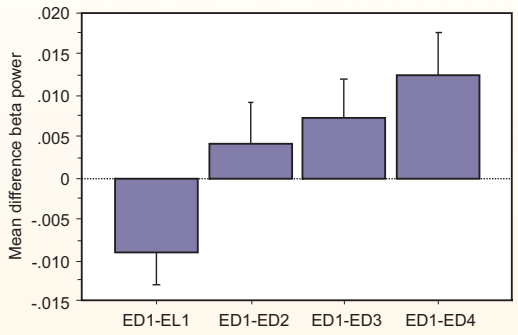
Method

Twenty-two subjects participated in a mixed-design experiment to investigate the impact of two levels of long-wavelength and short-wavelength lights. Electroencephalogram (EEG) measurements, electrocardiogram (ECG), and self-reports of sleepiness and mood were obtained 60 minutes prior to, during and after light exposure and included brain wave activity, heart rate and self-assessment reports.

Results

The researchers found that, compared to the previous dim-light period, the red and the blue lights:

- Increased alertness as evidenced by rhythmic activity changes on an electroencephalogram (EEG) reflecting increased beta power frequency.
- Reduced sleepiness and increased positive affect as evidenced by self reports.



Relative beta power density. Data for subjects are based upon the change in relative power in the beta frequency range from the end of the first dim-light period (ED1) to those at each of the other sampling periods. A negative number represents an increase in beta power.

ED1 = after 60 mins. dark

EL1 = after 60 mins. dark, followed by 60 mins. light

ED2 = after 60 mins. dark, followed by 60 mins. light, followed by 5 mins. dark

ED3 = after 60 mins. dark, followed by 60 mins. light, followed by 25 mins. dark

ED4 = after 60 mins. dark, followed by 60 mins. light, followed by 45 mins. dark

Conclusions

The results indicate that alertness and mood can be affected by light at night without necessarily stimulating the circadian system. The impact of light was modest, however, compared to the increase in fatigue over the course of the night

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Lighting Research Center, Rensselaer Polytechnic Institute • 21 Union Street • Troy, NY 12180 • (518) 687-7100 • www.lrc.rpi.edu