Short-wavelength (Blue) Light, Sleep/Wake Schedule, and Circadian Phase in Young Adults

Young adults prefer later bedtimes and later wakeup times, but social activities, such as early morning classes, may deprive them from getting an 8-hour sleep night. The goal of this study was to examine the effects of an advanced sleep/wake schedule and morning short wavelength (blue) light in 25 adults with late sleep schedules and subclinical features of delayed sleep phase disorder (DSPD).

Experiment

Twelve men and thirteen women ages 18-30 with late sleep schedules participated in this study. Participants wore a Daysimeter, a small, head-mounted device developed by the LRC to measure an individual's exposure to daily "circadian light," as well as rest and activity patterns. They kept their usual reported schedule and lighting routine during the first week of home monitoring, and came to the lab for an overnight session at the end of the week to assess their circadian phase.

During the second week of home monitoring, all participants were instructed to follow an advanced sleep/wake schedule. Upon wakening, half of the participants (blue-light group) were asked to sit for one hour in front of a 470-nm light box.The other half of participants (dim-light group) were asked to sit in front of the same light box, which was dimmed to 10% of the maximum brightness and directed away from their direction of gaze. The new sleep/wake schedule was typically 1-2.5 hours earlier than their average wake time during a baseline week. At the end of the second week, they returned to the lab for another overnight session to assess the timing of dim light melatonin onset (DLMO), an indicator of circadian phase.

Publication

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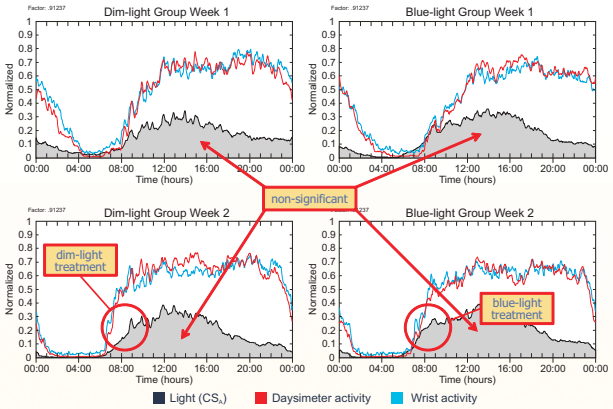
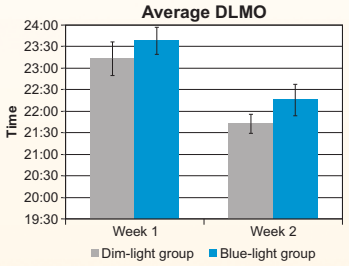
Sponsor

Trans-National Institutes of Health Genes, Environment and Health Initiative (NIH-GEI), National Institutes of Health #U01DA023822, *Light measuring device for correcting circadian disruption*



Circadian light and activity measured by the Daysimeter and activity measured by wrist actigraphs for the dim-light and the blue-light groups during both weeks of the study.

Results



Saliva samples were taken and analyzed to determine the timing of DLMO. There was a significant difference in circadian phase for participants in the dim-light (n = 13) and blue-light (n = 12) groups. There was no significant difference between groups.

After six days in an advanced sleep/wake schedule, both groups showed significant circadian phase advances. Morning short-wavelength (blue) light was not associated with larger phase shifts than dim-light exposure. Importantly, however, there was no significant difference in the total amount of circadian light that both groups were exposed to during the day.

Conclusions

Adherence to a fixed, advanced sleep schedule resulted in significant circadian phase advances in young adults with subclinical DSPD, whose usual sleep schedules were delayed. Light/dark exposures associated with fixed early sleep schedules are sufficient to advance circadian phase in young adults.

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