Light, Alertness, and Circadian Entrainment in Three Office Buildings

The goal of this research was to evaluate whether a lighting intervention designed to deliver high circadian stimulus (CS) in the morning to promote entrainment and low-CS red light in the afternoon to promote alertness would increase office workers' nighttime sleep quality and daytime alertness.

Methods
Twenty office workers (13 females, mean ± SD age of 46.7 ± 13.5 years) from 3 U.S. Department of State facilities in Washington, D.C., participated in the study. The study was conducted over 3 successive 1-week periods with 2 cohorts of participants in the fall of 2017. The participants wore Daysimeters and answered questionnaires inquiring about their subjective sleepiness (Karolinska Sleepiness Scale [KSS]) and vitality and alertness (Subjective Vitality Scale [SVS]) according to the schedule shown in the protocol, below.

Results
- Red light exposure significantly decreased subjective sleepiness during the post-lunch dip (15:00 h).
- High CS in the morning resulted in nonsignificantly earlier bedtimes and significantly earlier wake times.
- The lighting intervention nonsignificantly increased subjective vitality at 12:00 h, 15:00 h, and departure.

Conclusions
• Red light during the early afternoon can be effective for reducing post-lunch dip sleepiness.
• Blue light received in the morning advances circadian phase, leading to earlier sleep end (i.e., wake) times.
• Social activities can counter the phase-advancing effect of morning blue light and preclude people from going to bed earlier.

References