Late Evening Room Light and Sleep Restriction Reverses the Phase Advancing Effect of Bright Morning Light in Adolescents

Stephanie J. Crowley, PhD, Ieva Misiunaite, MA, and Charmane I. Eastman PhD
Biological Rhythms Research Laboratory, Department of Psychiatry & Behavioral Sciences, Rush University, Chicago IL USA

STUDY QUESTION
Does sleep restriction due to staying awake late reduce the phase advancing effects of morning bright light in adolescents?

METHOD
Participants: 38 adolescents (14.1-18.0 y); 21 female at birth; 17 male at birth

Study design:
- Days 1-7: 10-h sleep/dark at home (baseline)
- Days 8-14: Laboratory stay
  - Days 9 & 10: Bedtime \(0\)h (control; n=9), \(1.5\)h (n=9), \(3.0\)h (n=12), or \(4.5\)h (n=8) later than baseline. Room light \(\sim 100\) lux.
  - Days 11-13: 3-day gradual advance of sleep/wake + morning bright light (7,000 – 10,000 lux).
  - Days 8 & 14: Dim Light Melatonin Onset (DLMO) measured in < 5 lux.

Study design: (example protocol above)
- Days 1-7: 10-h sleep/dark at home (baseline)
- Days 8-14: Laboratory stay
  - Days 9 & 10: Bedtime \(0\)h (control; n=9), \(1.5\)h (n=9), \(3.0\)h (n=12), or \(4.5\)h (n=8) later than baseline. Room light \(\sim 100\) lux.
  - Days 11-13: 3-day gradual advance of sleep/wake + morning bright light (7,000 – 10,000 lux).
  - Days 8 & 14: Dim Light Melatonin Onset (DLMO) measured in < 5 lux.

CONCLUSIONS
- Adolescents usually go to bed late and restrict their sleep on school nights. These behaviors may contribute to a reduced response to morning bright light.
- Behavioral treatments for adolescents requiring phase advances to get earlier need to consider evening light exposure and sleep duration in their plans.

SUPPORT: R01 HL146772 (SJC)

Teens who are sleep restricted by staying awake late in room light

*advance less*

or

*shift the wrong way (delay)*

to morning bright light

Circadian Phase (DLMO) Shifts

Phase shifts differed among groups \(F(3,34)=36.7, p<.001\).

\* \(p<.05\); ** \(p<.01\)