

Sleep starts later as teens age, but school still starts early

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If school starts early in the morning and adolescent physiology naturally produces later bedtimes, the inevitable result is less sleep. A new study adds to the case for later school start times for middle and high school students. Credit: Mike Cohea/Brown University

A newly published study used activity monitors to track how sleep habits changed in younger and older teens as they grew during a two-year period. Key findings, for instance that the children fell asleep later as they matured and resisted sleep longer after the nightly onset of hormonal sleep signals, lend new support to recent recommendations by

the American Academy of Pediatrics that middle and high schools avoid starting earlier than 8:30 a.m.

Those recommendations, published in August, were based on a deep body of research evidence that although children require about nine hours of sleep throughout adolescence, older kids are naturally inclined to stay up later than younger ones. The new study, based at Brown University and the Lifespan health system, uniquely adds to that evidence. It appears in the journal *PLoS ONE*.

"This is one of the few studies that has tracked sleep behavior and circadian rhythms over the course of up to two-and-a-half years in the same adolescents," said lead author Stephanie Crowley, an assistant professor at Rush University Medical Center in Chicago who was a graduate student in the Brown University lab of senior author Mary Carskadon when the study was conducted. "A handful of studies have focused on [sleep duration](#) longitudinally [as children age] but this is one of the first to look at sleep timing longitudinally."

Tracking the changing [sleep patterns](#) of children as they age is important because numerous studies have found that teenagers don't get enough sleep. The negative effects researchers have found can include poor academic performance, mood disturbances, depression, obesity, and even drowsy driving accidents among older teens. Those are the kinds of problems that concerned the American Academy of Pediatrics.

Later to bed, still early to rise

According to the data in the new study, conducted with 94 children in all, children seem fated to get less sleep as they mature. A typical 9-year-old fell asleep at 9:30 p.m. on a weekday upon first enrolling in the study and would wake up at 6:40 a.m. By age 11, the same child would go to sleep at 10 p.m. but still awaken at the same time. The net result for that

child—and many others in the cohort of 38 children who joined the study at 9 or 10 years old—would be the loss of about half an hour of sleep every night.

"There are changes in sleep," Crowley said, "even as early as middle school."

In another example typified by the data, a volunteer who enrolled at age 15 going to sleep at 10:35 p.m. on a weekday and waking at 6:20 a.m., would leave the study at age 17 going to sleep at 11:05 p.m. and waking at 6:35 a.m. In other words, weekday sleep time continued to shrink with age for the 56 volunteers aged 15 or 16 who participated in the research.

What of weekends? The volunteers got considerably more sleep than on weekdays, despite falling asleep later and later with age. That's because were able to sleep later.

The typical kid in the study moved to a later sleep/wake cycle with aging, except during the week, when later waking was not possible, most likely because of early school bells. The 18-year-olds in the study slept dramatically longer on weekdays than they did when they were younger because they had graduated from high school.

The study is one of the few to track individual kids for longer than a year. It illustrates wide individual differences in these trajectories. For some children, the data show, the shift to a later bedtime without a later wakeup time was especially stark, possibly putting them at a greater disadvantage relative to their peers.

"We often say 'on average this is what's happening,' but there are youngsters who are more devastated by the kinds of issues they confront with school start times that are imposed on them," said Carskadon, professor of psychiatry and human behavior in the Warren Alpert School

of Medicine at Brown and director of the Sleep Research Center at the Bradley Hospital in East Providence. "These individual differences do change the impact of interventions [such as starting school later]."

'Resisting' a rest

Carskadon and Crowley's team measured another important difference in their younger and older cohorts of volunteers: a difference in how long the children resisted the tell-tale signal of biological night—the rise of the hormone melatonin as measured in their saliva. This interval between the time when the biological sleep signal emerged and when the [children](#) fell asleep is important because the longer kids resist that signal, the groggier they will be when they wake up in the morning.

The data showed that as teens got older they put off the signal up to an hour longer, staying up as long as two hours past the point when their brains became primed for sleep. By the following weekday morning, however, there had been less time to relieve that accumulated "sleep pressure."

"They were going to sleep at a later time in the biological night," Crowley said.

Carskadon continued: "They'll have an easier time falling asleep because they are so much past when the gate for [sleep](#) opens—but when they still have to get up in the morning, that's a problem."

Provided by Brown University

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