

Study: Pace of brain development still strong in late teens

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Boys and girls have put many of the trappings of teenagerhood behind them by the age of 18 or 19, but at least some of the brain resculpting that characterizes the decade of adolescence may still be going as strong as ever, according to findings in a new study that measured brainwaves of subjects in their midteens and again in their late teens.

One of the kinds of neurological changes underway in a teen brain is a pruning of unneeded connections forged earlier in life — the brain invests in developing some connections but sheds a higher volume of others. One way these changes can be measured, many researchers believe, is a drop in the power, or amplitude, of [brainwaves](#) over time.

What researchers found in their study of sleeping teens, said Mary Carskadon, professor of psychiatry and human behavior at the Warren Alpert Medical School of Brown University and director of the Sleep Research Center at Emma Pendleton Bradley Hospital, is that this amplitude reduction continues at about the same pace in the late teen years as in earlier years.

"There was a sense that the bulk of the change is happening in the younger adolescents," said Carskadon, the paper's senior author. "To see a continuation of this rapid and large change in the older [adolescents](#) was a surprise."

Their results appear in advance online in the journal *Sleep*.

Numbers from slumber

To conduct the study, the researchers asked five boys and nine girls aged 15 and 16 to sleep to certain preparatory specifications for a week at home and then to spend two nights in the lab while the team took all-night measurements. Then they brought the teens back two or three years later, between the ages of 17 and 19, for another week of preparatory sleep and then two more nights of monitored sleep. Previously, researchers in Carskadon's lab had done a similar study with younger teens.

Over the course of the study, the researchers also noted some other changes in the children over time. For example, they found that late teens continue an earlier teen trend of spending less and less time in so-called "slow-wave" sleep in favor of "stage 2" sleep. Meanwhile, they found that the reduction in electroencephalography (EEG) power seems to shift from the left side early in the teen years to the right side later in adolescence. That shift means that by the end of the teen years, the developmental process has occurred equally on both sides.

Lead author Leila Tarokh, a researcher at the University of Zurich and adjunct assistant professor of psychiatry and human behavior at Brown, said that although many previous studies using EEG, magnetic resonance imaging, or postmortem examination have yielded similar measurements of adolescent brain changes, this study added insight because of how it was structured.

"The unique feature of this study is that it puts together these EEG measures of power and looks at these sleep stages longitudinally (in the same people over time) and across several regions around the brain," she said.

Carskadon said that sleep is a convenient time to take long-term, well

controlled measurements of neural activity, but that the study does not show the role sleep may play in neural renovation among older teenagers.

"For us, [sleep](#) is a window onto the [brain](#)," Carskadon said.

Provided by Brown University

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