# How kids' brains respond to a late night up

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Credit: public domain

Any parent can tell you about the consequences of their child not getting enough sleep. But there is far less known about the details of how sleep deprivation affects children's brains and what this means for early brain development.

"The process of sleep may be involved in brain 'wiring' in childhood and thus affect brain maturation," explains Salome Kurth, first author of the study published in *Frontiers in Human Neuroscience*, and a researcher at the University Hospital of Zurich. "This research shows an increase in sleep need in posterior brain regions in children."

This contrasts with what researchers know about the effects of sleep deprivation in adults, where the effect is typically concentrated in the frontal regions of the brain.

After staying up too late, both children and adults need a period of deep sleep to recover. This recovery phase is characterized by an increase in an electrical pattern called slow-wave activity, which can be measured with a non-invasive technique called an electroencephalogram. With a large number of electrode channels distributed across the scalp, this method also detects which brain regions show more slow-wave activity than others.

Supported by a large student team, Kurth and her colleagues, Monique LeBourgeois professor at the University of Colorado Boulder, and Sean Deoni , professor at Brown University, studied the effects of 50% sleep deprivation in a group of 13 children between the ages of 5 and 12 years. The team first measured the children's deep sleep patterns during a normal night's sleep. They then re-measured on another night after the researchers had kept the children up well past their bedtimes by reading and playing games with them.

After only getting half of a night's worth of sleep, the children showed more slow-wave activity towards the back regions of the brain—the parieto-occipital areas. This suggests that the brain circuitry in these regions may be particularly susceptible to a lack of sleep.

The team also measured how this deep sleep activity correlated with the myelin content of the brain—a cornerstone of brain development. Myelin is a fatty microstructure of the brain's white matter that allows electrical information between brain cells to travel faster. It can be measured with a specific magnetic resonance imaging technique.

"The results show that the sleep loss effect on the brain is specific to certain regions and that this correlates with the myelin content of the directly adjacent regions: the more myelin in a specific area, the more the effect appears similar to adults," says Kurth. "It is possible that this effect is temporary and only occurs during a 'sensitive period' when the brain undergoes developmental changes."

Further exploration is needed before drawing any conclusions about how insufficient sleep affects early brain developmental processes in the longer term. But for now, these results suggest that going to bed too late may have a different impact on kids' brains than on adults'.

**More information:** Salome Kurth et al, Increased Sleep Depth in Developing Neural Networks: New Insights from Sleep Restriction in Children, *Frontiers in Human Neuroscience* (2016). DOI: 10.3389/fnhum.2016.00456

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