

# Adolescents stress more with poor sleep

January 15 2016, by Katherine Shonesy

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A new study from the University of Alabama at Birmingham indicates that adolescents who experience sleep problems and longer sleep duration are more reactive to stress, which could contribute to academic, behavioral and health issues.

Existing studies show that nearly 70 percent of U.S. [adolescents](#) do not

receive sufficient [sleep](#). It is also known that insufficient sleep and [sleep problems](#) contribute to cognitive problems and poor physical health over time, possibly because of disruptions in a key part of the neuroendocrine system that controls reactions to stress and regulates many body processes —the hypothalamic-pituitary-adrenal axis, or the HPA axis.

The relationship between sleep and the HPA axis has been studied in both children and adults; but little is known about this link during adolescence, which is a key period of time, as both sleep and the HPA axis are undergoing significant developmental changes related to puberty.

Sylvie Mrug, a psychology professor in UAB's College of Arts and Sciences, and her colleagues from UAB and Arizona State University sought to further explore the relationship between sleep and reactivity to stress, specifically as it relates to HPA-axis activity, in adolescents.

The researchers examined two dimensions of sleep—sleep duration and sleep problems from the perspectives of adolescents and their parents, as well as [cortisol levels](#) before and after social stress. The team also looked at how the results varied based on gender.

"We chose to look at [sleep patterns](#) in urban African-American adolescents, due to information we understood from earlier research in the field," Mrug said. "This particular population is more likely to experience insufficient sleep, and their functioning is more negatively affected by lower sleep quality, so we knew that finding results for this demographic could be especially important."

Eighty-four adolescents with an average age of approximately 13 took part in the study. During their visit to the research lab, participating adolescents were given the children's version of a common stress test, called the Trier Social Stress Test, to measure their physiological

responses to stress. This test involves speaking and computing mental math problems in front of an audience. Saliva samples were taken from each participant in order to test cortisol levels before and after the stress test.

Participants then reported on their bed times and wake times and any sleep problems, such as insomnia, daytime sleepiness and general [sleep quality](#), during a regular week. Parents of the adolescents were asked to report on their children's sleep as well.

The adolescents most commonly reported the following sleep problems: the need for multiple reminders to get up in the morning, not having a good night's sleep, feeling tired or sleepy during the day, and not being satisfied with their sleep.

The researchers looked at the cortisol levels of the adolescent participants. Cortisol release during and after the stressful lab test was higher for adolescents who reported more sleep problems and longer sleep duration, and whose parents reported longer sleep duration.

"The result of higher cortisol levels in adolescents experiencing sleep problems was exactly what we expected to see," Mrug said. "We were, however, surprised that longer sleep duration predicted a stronger cortisol response, because previous studies linked shorter sleep duration with higher cortisol levels. Generally, less sleep is related to poor outcomes, not the other way around. In this case, this unexpected result could be explained by considering that longer [sleep duration](#) does not necessarily reflect higher-quality sleep, but instead may serve as another indicator of sleep problems, at least among urban adolescents."

The effects of sleep problems on greater cortisol release during stress were stronger in females than in males, suggesting that adolescent girls may be more sensitive to disrupted and poor quality sleep.

"Overall, the results of our study confirm what we originally hypothesized—that sleep problems induce greater response to stress in adolescents," Mrug said. "It's important that we know this, because the enhanced and prolonged activation of the HPA axis in response to stress could contribute to more health problems. The urban African-American youth whom we studied may be particularly negatively affected by poor sleep because they are more likely to experience uncontrollable [stress](#) related to community and school violence. We want to do all that we can to understand ways we can help ensure better cognitive, emotional and physical health outcomes for these adolescents."

Mrug's study was published online in *Physiology and Behavior* in December and will appear in print in March 2016.

**More information:** Sylvie Mrug et al. Sleep problems predict cortisol reactivity to stress in urban adolescents, *Physiology & Behavior* (2016). [DOI: 10.1016/j.physbeh.2015.12.003](https://doi.org/10.1016/j.physbeh.2015.12.003)

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