

Study links structural brain changes to behavioral problems in children who snore

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A large study of children has uncovered evidence that behavioral problems in children who snore may be associated with changes in the structure of their brain's frontal lobe. The findings support early

evaluation of children with habitual snoring (snoring three or more nights a week). The research, published in *Nature Communications*, was supported by the National Institute on Drug Abuse (NIDA) and nine other Institutes, Centers, and Offices of the National Institutes of Health.

Large, population-based studies have established a clear link between snoring and behavioral problems, such as inattention or hyperactivity, but the exact nature of this relationship is not fully understood. While a few small studies have reported a correlation between [sleep apnea](#)—when pauses in breathing are prolonged—and certain [brain changes](#), little is known about whether these changes contribute to the behaviors seen in some [children](#) with obstructive sleep-disordered breathing (oSDB), a group of conditions commonly associated with snoring that are characterized by resistance to breathing during sleep.

To address this knowledge gap, researchers led by Amal Isaiah, M.D., D.Phil., of the University of Maryland School of Medicine, capitalized on the large and diverse dataset provided by the Adolescent Brain Cognitive Development (ABCD) Study, a long-term study of child health and [brain development](#) in the United States. The team of researchers mined this wealth of data from more than 11,000 9- and 10-year-old children to examine the relationships among snoring, [brain structure](#), and behavioral problems.

"This is the largest study of its kind detailing the association between snoring and brain abnormalities," said study lead author Amal Isaiah. "These brain changes are similar to what you would see in children with attention deficit hyperactivity disorder. Children have loss of cognitive control which is additionally associated with disruptive behavior."

Confirming the results of previous work, their statistical analysis revealed a positive correlation between habitual snoring and behavioral problems, with the children who most frequently snored generally

exhibiting worse behavior according to an assessment completed by parents. The findings further showed that snoring is linked to smaller volumes of multiple regions of the brain's frontal lobe, an area involved in cognitive functions such as problem solving, impulse control, and social interactions. The [statistical analysis](#) also suggested that the brain differences seen in children who snore may contribute to behavioral problems, but additional work on how snoring, brain structure, and behavioral problems change over time is needed to confirm a [causal link](#).

This study's findings point to oSDB as a potential reversible cause of [behavioral problems](#), suggesting that children routinely be screened for snoring. Children who habitually snore may then be referred for follow-up care. Such care may include assessment and treatment for conditions that contribute to oSDB, such as obesity, or evaluation for surgical removal of the adenoids and tonsils.

The ABCD Study, the largest of its kind in the United States, is tracking nearly 12,000 youth as they grow into young adults. Investigators regularly measure participants' brain structure and activity using magnetic resonance imaging (MRI) machines, and collect psychological, environmental, and cognitive information, as well as biological samples. The goal of the study is to define standards for normal brain and cognitive development and to identify factors that can enhance or disrupt a young person's life trajectory.

"We know the brain has the ability to repair itself, especially in children, so timely recognition and treatment of obstructive sleep disordered breathing may attenuate these brain changes. More research is needed to validate such mechanisms for these relationships which may also lead to further treatment approaches," said study co-author Linda Chang, MD, MS, Professor of Diagnostic Radiology and Nuclear Medicine who is a co-principal investigator on the ABCD study.

More information: Isaiah A, et al. Associations between frontal lobe structure, parent-reported obstructive sleep disordered breathing and childhood behavior in the ABCD dataset. *Nature Communications*. [10.1038/s41467-021-22534-0](https://doi.org/10.1038/s41467-021-22534-0) (2021).

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