

Air pollution exposure linked to poor academics in childhood

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Children exposed to elevated levels of air pollution may be more likely to have poor inhibitory control during late childhood and poor academic skills in early adolescence, including spelling, reading comprehension, and math skills. Difficulty with inhibition in late childhood was found to be a precursor to later air pollution-related academic problems. Interventions that target inhibitory control might improve outcomes.

Results of the study by researchers at the Columbia Center for Children's Environmental Health (CCCEH) at Columbia University Mailman School of Public Health and Columbia University Irving Medical Center are published in the journal *Environmental Research*.

"Children with poor [inhibitory control](#) are less able to override a common response in favor of a more unusual one—such as the natural response to say 'up' when an arrow is facing up or 'go' when a light is green—and instead say 'down' or 'stop,'" says first author Amy Margolis, Ph.D., associate professor of medical psychology in the Department of Psychiatry at Columbia University Irving Medical

Center. "By compromising childhood inhibitory control, [prenatal exposure](#) to air pollution may alter the foundation upon which later academic skills are built."

"When evaluating student's learning problems and formulating treatment plans, parents and teachers should consider that academic problems related to environmental exposures may require intervention focused on inhibitory control problems, rather than on content-related skill deficits, as is typical in interventions designed to address learning disabilities," Margolis adds.

"This study adds to a growing body of literature showing the deleterious health effects of prenatal exposure to air pollution on child health outcomes, including academic achievement," says co-author Julie Herbstman, Ph.D., CCCEH director and associate professor of environmental health sciences at Columbia Mailman School. "Reducing levels of air pollution may prevent these adverse outcomes and lead to improvements in [children's](#) academic achievement."

The new findings align with prior Columbia research finding a DNA marker for PAH exposure was associated with altered development of self-regulatory capacity and ADHD symptoms.

The study followed 200 children enrolled in a longitudinal cohort study in Northern Manhattan and the Bronx led by CCCEH researchers. Researchers collected measures of prenatal airborne polycyclic aromatic hydrocarbons (PAH, a major component of air pollution) during the third trimester of pregnancy, a period when the fetus is highly vulnerable to environmental insults. Tests of inhibitory control were administered at or around age 10 and tests of academic achievement, at or around age 13.

Inhibitory control and learning

When students learn new concepts, they often need to override a previous habit in order to incorporate a new rule into a skill. For example, when learning to read a vowel, a child will learn that the letter a has a short vowel sound "a as in apple" but a long sound when the consonant is followed by a "magic e," as in "rate."

More information: Amy E. Margolis et al, Prenatal exposure to air pollution is associated with childhood inhibitory control and adolescent academic achievement, *Environmental Research* (2021). [DOI: 10.1016/j.envres.2021.111570](https://doi.org/10.1016/j.envres.2021.111570)

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