

Office air quality may affect employees' cognition, productivity

September 9 2021



Credit: Pixabay/CC0 Public Domain

The air quality within an office can have significant impacts on employees' cognitive function, including response times and ability to focus, and it may also affect their productivity, according to new

research led by Harvard T.H. Chan School of Public Health.

The one-year study, which included participants in offices across six countries working in a variety of fields, including engineering, real estate investment, architecture, and technology, found that increased concentrations of fine particulate matter (PM_{2.5}) and lower ventilation rates (measured using carbon dioxide (CO₂) levels as a proxy) were associated with slower response times and reduced accuracy on a series of cognitive tests. The researchers noted that they observed impaired cognitive function at concentrations of PM_{2.5} and CO₂ that are common within indoor environments.

"Our study adds to the emerging evidence that air pollution has an impact on our brain. The findings show that increases in PM_{2.5} levels were associated with *acute* reductions in cognitive function. It's the first time we've seen these short-term effects among younger adults," said Jose Guillermo Cedeño Laurent, a research fellow in the Department of Environmental Health and lead author of the study. "The study also confirmed how low ventilation rates negatively impact cognitive function. Overall, the study suggests that poor indoor [air quality](#) affects health and productivity significantly more than we previously understood."

The study will be published online in *Environmental Research Letters* on September 9, 2021.

A growing body of research has shown that indoor and outdoor air pollution diminishes cognitive function. While it is well known that air pollutants such as PM_{2.5} can penetrate indoor environments, few studies have focused on how indoor exposures to PM_{2.5} and outdoor air ventilation rates affect cognition. Cedeño-Laurent noted that this is a particularly important area of research given the high percentage of time people spend indoors, especially office workers.

To better understand the issue, the research team enrolled more than 300 [office workers](#) in cities across China, India, Mexico, Thailand, the United Kingdom, and the United States. All participants were between the ages of 18 and 65, worked at least three days a week in an office building, and had a permanent workstation within the office. Each participant's workspace was outfitted with an environmental sensor that monitored in real-time concentrations of PM_{2.5} and CO₂, as well as temperature and relative humidity. Additionally, each participant had a custom-designed app on their phones through which cognitive tests and surveys could be administered.

Study participants were prompted to participate in tests and surveys at prescheduled times or when the environmental sensors detected levels of PM_{2.5} and CO₂ that fell below or exceeded certain thresholds. Two types of tests were administered: One test required employees to correctly identify the color of displayed words and was used to evaluate cognitive speed and inhibitory control—the ability to focus on relevant stimuli when irrelevant stimuli are also present. The second test consisted of basic arithmetic questions and was used to assess cognitive speed and working memory.

The study found that response times on the color-based test were slower as PM_{2.5} and CO₂ levels increased. They also found that accuracy on the color-based test was affected by PM_{2.5} and CO₂ levels. For the arithmetic-based test, the study found that increases in CO₂ but not PM_{2.5} were associated with slower [response times](#). As concentrations of both pollutants increased, however, participants completed fewer questions correctly in the allotted [test](#) time.

"The world is rightly focused on COVID-19, and strategies like better ventilation and filtration are key to slowing infectious disease transmission indoors," said Joseph Allen, associate professor of exposure assessment of science and senior author on the study. "Our research

consistently finds that the value proposition of these strategies extends to cognitive function and productivity of workers, making healthy buildings foundational to public health and business strategy moving forward."

More information: Jose Guillermo Cedeño Laurent et al, Associations between acute exposures to PM2.5 and carbon dioxide indoors and cognitive function in office workers: a multicountry longitudinal prospective observational study, *Environmental Research Letters* (2021). [DOI: 10.1088/1748-9326/ac1bd8](https://doi.org/10.1088/1748-9326/ac1bd8)

Provided by Harvard T.H. Chan School of Public Health

Citation: Office air quality may affect employees' cognition, productivity (2021, September 9) retrieved 24 April 2024 from <https://phys.org/news/2021-09-office-air-quality-affect-employees.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.