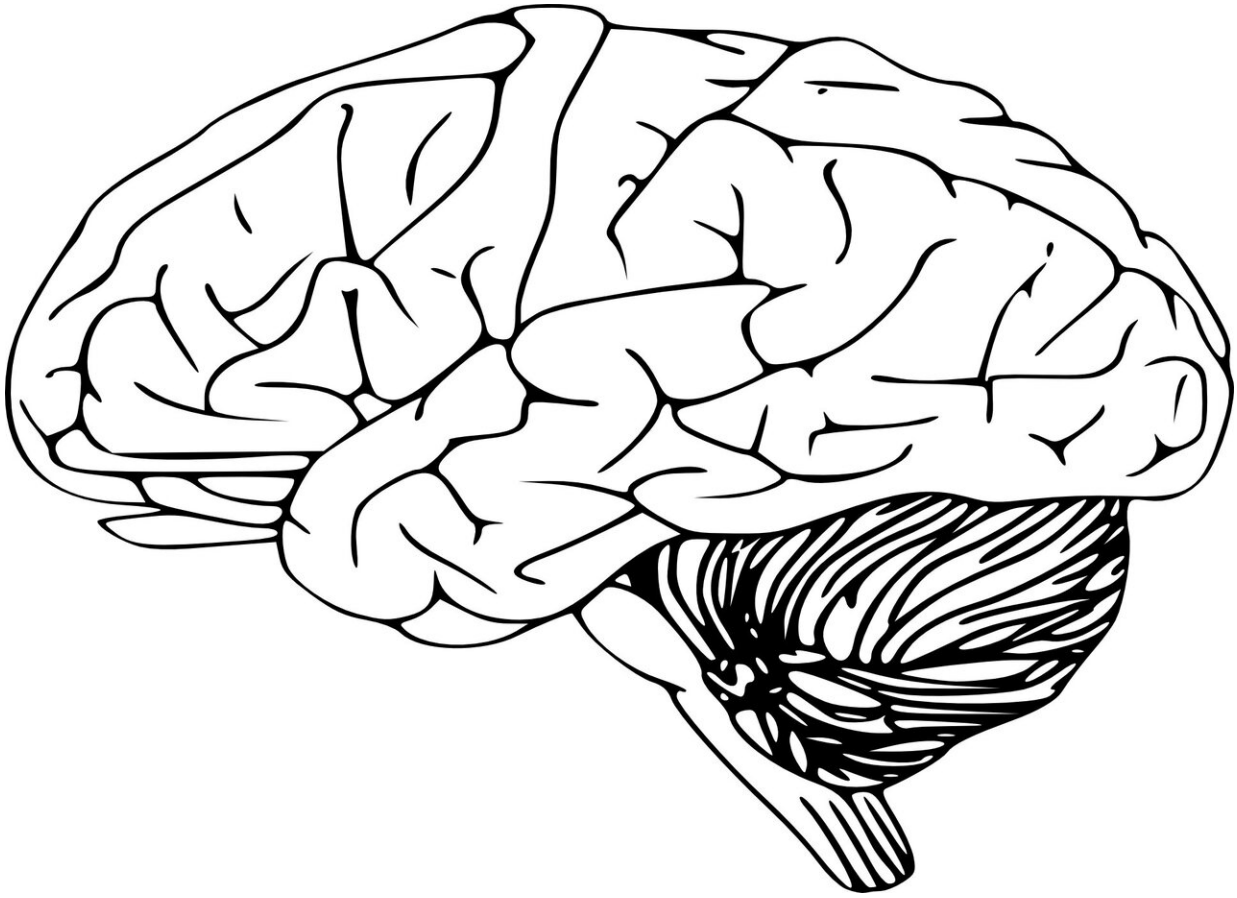
Air pollution may increase risk of dementia, complicated by genetics

May 2 2023



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Three years ago, an international study commissioned by the journal *Lancet* listed 12 modifiable factors that increased the risk of dementia,

including three new ones: excessive alcohol, head injury and air pollution.

Writing in the May 2, 2023 issue of the *Journal of Alzheimer's Disease*, a team of researchers, led by scientists at University of California San Diego, further elaborate on how exposure to the last of those new factors—ambient air pollution, such as car exhaust and power plant emissions—is associated with a measurably greater risk of developing dementia over time.

Senior author William S. Kremen, Ph.D., professor of psychiatry and co-director of the Center for Behavior Genetics of Aging at UC San Diego School of Medicine, and colleagues examined baseline cognitive assessments of approximately 1,100 men participating in the ongoing Vietnam Era Twin Study of Aging. Average baseline age was 56, with 12 years of follow up.

They additionally looked at measures of exposure to particular matter (PM2.5) in the air and nitrogen dioxide (NO_2), which is created when fossil fuels are burned, and assessments of episodic memory, executive function, verbal fluency, brain processing speed and APOE genotype.

APOE is a gene that provides instructions for making a protein crucial to the transport of cholesterol and other fats in the bloodstream. One version or allele of APOE called APOE-4 has been identified as a strong risk factor gene for Alzheimer's disease.

The researchers found that participants with higher levels of exposure to PM2.5 and NO_2 in their 40s and 50s displayed worse cognitive functioning in verbal fluency from age 56 to 68. And persons with the APOE-4 allele appeared even more sensitive, with those exposed to higher PM2.5 levels showing worse outcomes for executive function and those with higher NO_2 exposure showing worse outcomes involving

episodic memory.

Executive function refers to higher-level cognitive skills used to plan, control and coordinate mental behaviors and acts. Episodic memory is the ability to recall and re-experience distinct, specific past events.

"The 2020 Lancet report concluded that modifying 12 risk factors, which include others like education and depression at midlife, could reduce dementia incidence by as much as 40%," said first author Carol E. Franz, Ph.D., professor of psychiatry and co-director of the Center for Behavior Genetics of Aging.

"That report placed ambient air pollution as a greater risk for Alzheimer's and related dementias than diabetes, physical activity, hypertension, alcohol consumption and obesity. Our findings underscore the importance of identifying modifiable risk factors as early in life as possible—and that the processes by which air pollution affects risk for later-life cognitive decline begins earlier than previous studies suggest."

More information: Carol E. Franz et al, Associations Between Ambient Air Pollution and Cognitive Abilities from Midlife to Early Old Age: Modification by APOE Genotype, *Journal of Alzheimer's Disease* (2023). DOI: 10.3233/JAD-221054

Provided by University of California - San Diego