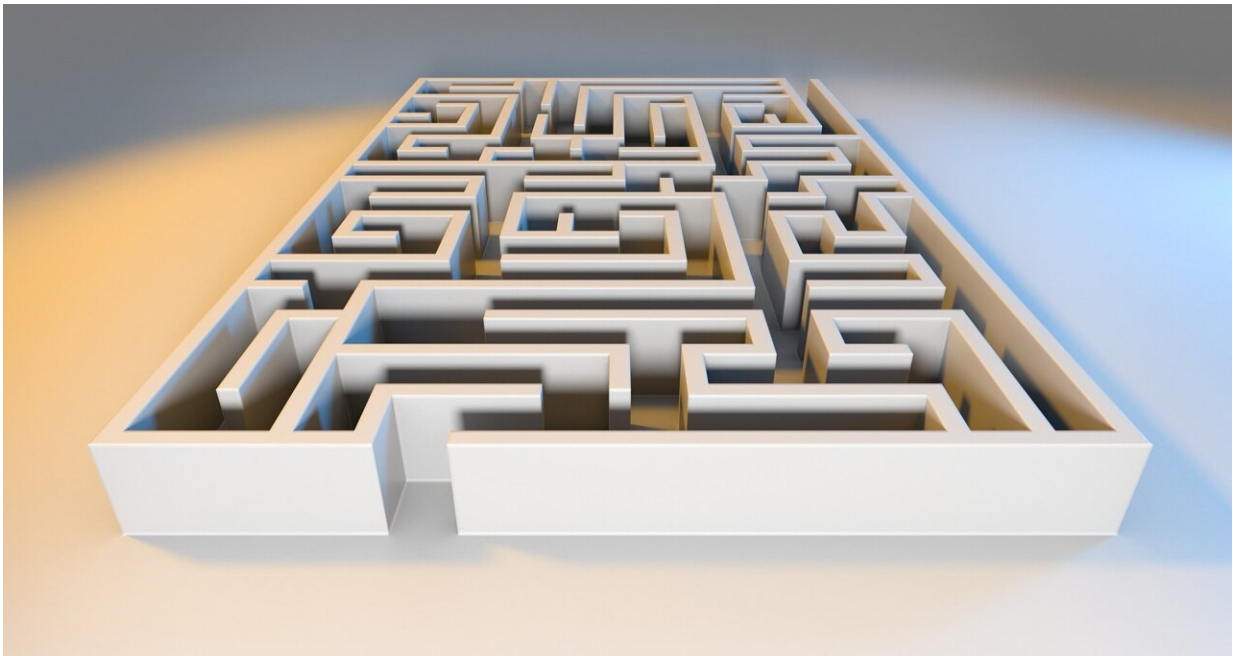


How older people explore new spaces could suggest cognitive decline and dementia

June 11 2024



Credit: Pixabay/CC0 Public Domain

Spatial navigation—the ability to select and follow a route from one place to another—is a skill we use every day. Depending on practice, general cognitive ability, and childhood environment, some people are naturally better at this than others. But research has also shown that people's skill in spatial navigation tends to decrease with increasing age.

This decline in navigation skill has been generally attributed to worsening spatial memory, due to changes in [brain structure](#) and function that naturally occur with age. But what if it isn't just due to our spatial memory declining, but also to changes in how we explore a novel environment? Such a shift has been observed in aging animals, ranging from insects to rodents and fish.

And now, an analogous shift in exploration behavior in middle age has been shown for the first time in humans. These results, which ultimately could have clinical applications, are [published](#) in *Frontiers in Aging Neuroscience*.

An exploratory study

First author Dr. Vaisakh Puthusseryppady, a postdoctoral researcher at the University of California at Irvine, said, "Compared to younger individuals, middle-aged people exhibit overall less exploration when learning a novel [maze](#) environment, and seem to be prioritizing learning specific important locations in the maze as opposed to the overall maze layout."

Puthusseryppady and colleagues recruited 87 middle-aged (on average 50 years old) and 50 young (on average 19 years old) women and men as volunteers. None had a history of neurologic disease including dementia, or psychiatric illness.

The researchers tested how well the volunteers explored and learned to navigate a maze in virtual reality. The maze was composed of crossroads and corridors, separated by hedges. Distinctive objects were scattered around it at strategic locations as landmarks. In the first "exploration phase," the volunteers were instructed to freely explore the maze and learn the locations of the objects.

In each of the 24 trials in the second "wayfinding phase," the volunteers had to apply what they had learned, navigating between two randomly chosen objects within 45 seconds.

As expected, young people on average had a greater success rate in finding their way. But importantly, further [statistical analyses](#) showed that this difference in success rate was partially driven by observed qualitative changes in how young vs. middle-aged participants learned about the maze.

"Compared to younger individuals, middle-aged individuals explored the maze environment less, as they traveled less distance, paused for longer periods of time at decision points, and visited more objects than [young individuals](#)," said Dr. Mary Hegarty, a professor at the Department of Psychological and Brain Sciences of the University of California at Santa Barbara, and a joint corresponding author.

These differences were so notable, the authors were able to predict using artificial intelligence whether a participant was middle-aged or young.

Pointing the way for applications

Reduced exploration in middle-aged people may be due to age-related changes in the brain's navigation network, for example, the medial temporal and parietal lobes.

The authors speculated that these findings could inform training interventions to help middle-aged adults to improve their navigation abilities and preserve cognitive ability.

Co-author Daniela Cossio, a Ph.D. student at the University of California at Irvine, explained, "If we were to train [middle-aged people](#) to explore novel environments better—with a focus on traveling greater

distances, visiting paths that connect the environment, in a more spread-out manner—this might lead to improvements in their spatial memory, helping to slow down their decline in cognitive ability."

Dr. Elizabeth Chrastil, one of the corresponding authors, and an associate professor at the same institute, added, "We are currently investigating whether these kinds of changes in exploration behavior can be identified in people at risk of Alzheimer's disease, as well as in those who actually have Alzheimer's. We anticipate that altered exploration behavior could ultimately become a novel clinical marker for early cognitive decline related to Alzheimer's."

More information: Less spatial exploration is associated with poorer spatial memory in midlife adults, *Frontiers in Aging Neuroscience* (2024). [DOI: 10.3389/fnagi.2024.1382801](https://doi.org/10.3389/fnagi.2024.1382801)

Provided by Frontiers

Citation: How older people explore new spaces could suggest cognitive decline and dementia (2024, June 11) retrieved 11 July 2024 from <https://medicalxpress.com/news/2024-06-older-people-explore-spaces-cognitive.html>

<p>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.</p>
--