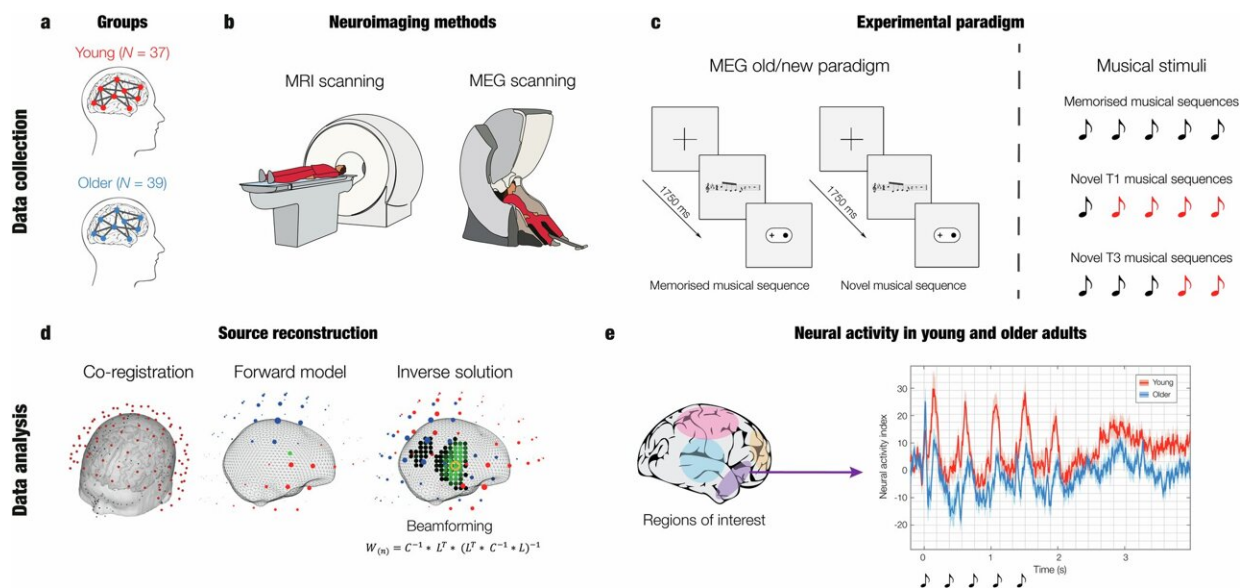


Music can reveal which areas of the brain are affected by aging

September 4 2024, by Line Rønn



Experimental design, stimuli, and analysis pipeline. Credit: *Communications Biology* (2024). DOI: 10.1038/s42003-024-06587-7

Older people are just as capable as younger individuals of remembering musical pieces—but certain parts of their brains must work harder. This is shown in a new study from Aarhus University, recently [published](#) in the journal *Communications Biology*.

The study is remarkable because it combines [classical music](#) and neurophysiology to map the changes that occur in the brain with age.

At Aarhus University Hospital, 76 participants underwent [brain scans](#) while listening to a piano piece by the German composer and organist Johann Sebastian Bach, which they had heard twice beforehand.

The study shows that when older individuals listen to familiar music, sensory-related areas of the brain become extra active, while the regions responsible for [memory function](#) are less active.

"This suggests that the sensory areas of older brains work harder to compensate for the reduced response from the areas typically involved in [memory processes](#)," explains Associate Professor Leonardo Bonetti from the Center for Music in the Brain, part of the Department of Clinical Medicine at Aarhus University. He conducted the study alongside researchers from the University of Oxford.

"The study emphasizes that changes in brain functionality do not necessarily lead to disease or dysfunction. Aging is not just about having a declining brain, but about having a brain that adapts to challenges and compensates for mechanisms that become less effective," he explains.

Potential applications in dementia research

During the scanning, participants were also presented with altered versions of the original melodies.

The scans showed that when older people listen to variations of music they haven't heard before, the core parts of the brain involved in memory processes react less than they do in [younger people](#). The activity in sensory-related regions remains unchanged.

"The older group simply does not show the same brain responses when hearing new variations of the music as the younger group. This may help explain the mechanism that makes it challenging for [older people](#) to cope

with changes in general," says Bonetti.

He hopes the study will improve the understanding of how memory functions and that, in the long term, it could influence how we screen older individuals at risk of developing dementia.

"We are now planning to expand the study to include people with mild dementia. The hope is that we can identify biomarkers and use the data to predict how changes in brain functionality indicate the likelihood of developing dementia," the researcher says.

Bach's music is well-suited for memory studies

The study used music sequences inspired by Johann Sebastian Bach's compositions, and this was no coincidence, says Bonetti.

Bach's music is very easy to remember because it combines strong harmonies and a clear hierarchical structure, which is repeated many times, especially in the Prelude in C Minor from *Das Wohltemperirte Clavier*, for which the researchers created a simplified and controlled version.

"The participants heard the piece twice and then remembered it. In memory research, music is often better than, for example, numbers or text, because it is intuitively memorable. This allows us more easily to discover how the brain processes information over time. Therefore, music is an excellent tool for understanding how the brain changes its function to support memory as we age," explains Bonetti.

More information: Leonardo Bonetti et al, Age-related neural changes underlying long-term recognition of musical sequences, *Communications Biology* (2024). [DOI: 10.1038/s42003-024-06587-7](https://doi.org/10.1038/s42003-024-06587-7)

Provided by Aarhus University

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