

Boosting brain function in later life through singing

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Credit: Tima Miroshnichenko from Pexels

Ask anyone in a choir why they enjoy it, and they will tell you about the euphoric effects singing has on their mental health. A team of neuroscientists and clinical psychologists based at the University of

Helsinki (Finland) believe these benefits could extend to improving brain function and treating aphasia.

Professor Teppo Särkämö is studying how aging affects the way singing is processed by the [brain](#), which could have important therapeutic applications. "We know a lot about speech processing, but not much about singing. We're exploring how different singing related functions might be preserved in many neurological diseases," he explained.

For people with aphasia, a condition which severely impairs communication and is commonly caused by stroke, communication can be almost impossible as they struggle to sound out the right words. Yet, through a technique known as "melodic intonation therapy"—whereby people are asked to sing an everyday sentence instead of speaking it—quite incredibly they often find a voice.

Coordinator of the [PREMUS](#) project, Prof Särkämö and his team are using similar methods, scaling-up the approach through specially-run 'senior choirs' that involve aphasic patients and their families. The scientists are exploring how singing could play an important rehabilitative role for cases of aphasia and might prevent [cognitive decline](#) too.

Hitting the right notes

The PREMUS study is coordinated with a local aphasia organization in Helsinki and involves around 25 people per choir, both aphasia patients and their family caregivers. Results of the trial show encouraging results.

"Ultimately, the aim through our work with persons with aphasia is to use singing as a tool to train speech production and eventually enable them to communicate without singing. But through the choirs we are beginning to see how this approach is translating to people's daily life as

an important communication tool," said Särkämö.

Alongside an aphasia choir, the team has also carried out extensive fMRI brain scans of young, middle aged and older adults who participate in choirs to understand why singing is so important at different life stages. Their results indicate that as we age, the brain networks involved in singing undergo fewer changes than those that process speech, suggesting that singing is more widespread in the brain and more resilient to aging.

Their studies also suggest that being actively engaged in singing, as opposed to listening to choral music for example, is crucial. "When you're singing, you are engaging in the frontal and parietal systems in the brain where you regulate your own behavior, and you use more of your motor and cognitive resources in terms of vocal control and executive functions," said Särkämö.

Early results from a [longitudinal study](#), which compared neurocognitive functioning between members of senior choirs and healthy [older adults](#) (who do not sing) showed the positive effects of singing on cognitive and auditory functioning and the importance of the social interaction it brings, which may help delay the onset of dementia.

Choir members performed better in neuropsychological tests, reported fewer cognitive difficulties, and had higher social integration. Electroencephalogram measurements of the same groups suggest that the choir singers had more advanced higher-level auditory processing abilities, especially for combining pitch and location information in frontotemporal brain regions, something Särkämö attributes to the complexity of the sound environment in [choir](#) singing.

The next step will be to replicate and expand this work with senior choirs for patients diagnosed with Alzheimer's and to develop a large-scale

clinical trial to test the effect. The challenge, however, is likely to be different with Alzheimer's: whereas patients may remember songs from their past, Särkämö is unsure to what extent they can learn and retain new lyrics.

He is both optimistic and realistic about this work. "This is all about trying to stimulate the remaining networks in the brain. We believe singing could help to regain some of those functions, but of course with Alzheimer's it's a brutal, progressive disorder so it's a matter of buying more time and trying to slow down the pattern of decline happening already."

Same song sheet

Someone else firmly focused on responding to the challenges of an aging population is Christian A. Drevon, Professor of medicine at the University of Oslo (Norway). Drevon is a specialist in biomarkers and is now using his expertise to understand the different factors affecting neurocognitive function in the EU-funded [Lifebrain](#) project.

"Most studies about Alzheimer's are cross-sectional where you take a group of people, look at a certain time and associate certain things with those who have the disease and those who don't," he explained.

"However, this is often not causal; you can't tell if it's the reason for the disease or if it's just a consequence of it."

To really understand what's happening with Alzheimer's and dementia, data are needed for individuals spanning periods both when they are healthy and when they are not, to tease apart what has gone wrong. Unpicking this question is the primary aim of Lifebrain, coordinated by psychologists Professors Kristine Walhovd and Anders Fjell.

By pooling pre-existing MRI brain scan data from people right across

Europe, the Lifebrain project has analyzed the significance of a range of different factors on cognition when we age and how this might vary between individuals.

To analyze more than 40,000 brain scans from more than 5,000 people aged 18–80 across seven countries, the first challenge was to harmonize the data. Do MRI scans in Sweden and Spain produce the same results? To ensure they do, Lifebrain sent eight participants around Europe to be scanned and to adjust equipment accordingly.

All psychological tests (including cognitive tests) and other collected data (body weight; demographic; genetic; and lifestyle data, including sleep and diet) were harmonized.

Next, the team linked MRI data with additional databases which uncovered new insights about how where you live and [what access you have to green space](#) might help lower dementia risk. Conversely, it also helped to reveal how [education](#) and [sleep](#) may be less important for future risk of dementia than previously assumed.

"Lots of studies have claimed education is really important for reducing the risk of dementia. But if you follow people longitudinally through life there's actually no association," said Drevon. "That doesn't mean education isn't important; it means it's probably not true that education will prevent you from developing dementia. We have to search for other factors of importance."

Given the expense of MRIs, Drevon suggests tiny blood samples (dried blood spots) could be taken by finger-prick without professional support to provide individual insights in the future. Analyzed in an advanced laboratory like [Vitas Ltd](#)—Lifebrain partner—this could be a game-changer in providing tailored, online advice about individual risks.

"If you really want to improve lifestyle, you probably have to personalize it. You have to measure several factors on an individual level across the life course," he said. "Our best chance of fighting cognitive decline and dementia will come from early [preventative measures](#) using this lifespan data approach."

Work out songs

In time Prof. Drevon hopes these personalized insights could help delay or potentially eradicate certain aspects of dementia. In the meantime, what about singing to stave off cognitive decline as proposed by Särkämö through the PREMUS project? Does he agree singing could be an important preventative step?

"Well, the brain is like a muscle. If you train it, you make it fit, and if you use your brain for singing, it's complicated, there are a lot of processes, it's about remembering. Of course, there are other ways of training the brain, but singing is a very good example of how you can help to improve [brain function](#)."

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