

Novel information on the neural origins of speech and singing

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The neural network related to speech is mostly located in the left

cerebral hemisphere, while singing has been primarily associated with the structures of both hemispheres. However, a new study indicates that the left hemisphere has a greater significance, including in terms of singing, than previously thought.

"According to a notion prevalent for more than 50 years, the potential preservation of singing ability in [aphasia](#) is based on the fact that the right [hemisphere](#) of the brain offers, as it were, a detour to expressing sung words," says Doctoral Researcher Anni Pitkäniemi from the University of Helsinki.

This theory has also served as a basis for the development of singing-based rehabilitation strategies for patients with aphasia, or difficulty producing speech due to cerebrovascular disease.

However, a study recently published in *Communications Biology* and carried out by the Cognitive Brain Research Unit at the University of Helsinki found that, contrary to the researchers' expectations, the ability to produce words by singing was associated not with the structures of the right hemisphere, but, as with speech, with the language [network](#) of the left hemisphere.

Both shared and distinct neural connections

Another key finding in the study was that, while the results indicate that the production of speech and singing are centrally linked to the language network of the brain, they are partially dispersed into distinct circuits under that network.

In fact, it was found that the production of sung words was linked to a specific part of the language network, the ventral stream associated with understanding speech.

In contrast, fluent speech was connected in patients with aphasia not only with what is known as the dorsal stream of the [left hemisphere](#), associated with [speech production](#), but also with other connections. These include the above-mentioned ventral stream as well as pathways entirely outside the language network, which are more commonly associated with [information processing](#) and motor functions in the brain.

"The scale of the network demonstrates the complexity of conversation-level speech," Pitkäniemi points out.

"The observation also now explains why the ability to produce familiar lyrics is preserved only in certain patients," she adds. The extent of damage within the language network, she further remarks, has the largest effect on this.

According to Pitkäniemi, the structures of the right hemisphere considered central to singing are likely to play a more important role in other significant factors associated with singing, including the production of melody and rhythm.

Toward increasingly personalized rehabilitation

For centuries, researchers have been interested in the relationship between music and [language](#).

"There are cases in research literature dating back to the eighteenth century of persons with stroke losing their ability to speak due to aphasia, while unexpectedly retaining the ability to sing the words of familiar songs fluently," Pitkäniemi says.

Next, the researchers at the University of Helsinki intend to investigate which brain networks are connected, for example, to learning new songs or producing melody and rhythm. The goal is to find methods based on

singing for rehabilitating people with aphasia, which could be applied in an increasingly personalized and effective manner.

"The findings of the recently published study can already help define biological markers that could be useful, for example, in assessing the effectiveness of treatment or rehabilitation," Pitkäniemi muses.

"The findings also provide indications of the at least partly parallel development of [speech](#) and singing, which is interesting from the perspective of evolutionary neuroscience," she adds.

More information: Anni Pitkäniemi et al, Hodological organization of spoken language production and singing in the human brain, *Communications Biology* (2023). [DOI: 10.1038/s42003-023-05152-y](https://doi.org/10.1038/s42003-023-05152-y)

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