

Bilinguals of two spoken languages have more gray matter than monolinguals

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Left hemisphere of J. Piłsudski's brain, lateral view.
Credit: public domain

A new study published in the journal *Cerebral Cortex* suggests people who speak two languages have more gray matter in the executive control region of the brain.

In past decades, much has changed about the understanding of bilingualism. Early on, bilingualism was thought to be a disadvantage because the presence of two vocabularies would lead to delayed language development in children. However, it has since been demonstrated that bilingual individuals perform better, compared with monolinguals, on tasks that require attention, inhibition and short-term memory, collectively termed "executive control."

This "bilingual advantage" is believed to come about because of [bilinguals'](#) long-term use and management of two spoken languages. But skepticism still remains about whether these advantages are present, as they are not observed in all studies. Even if the advantage is robust, the mechanism is still being debated.

"Inconsistencies in the reports about the bilingual advantage stem primarily from the variety of tasks that are used in attempts to elicit the advantage," says senior author Guinevere Eden, DPhil, director for the Center for the Study of Learning at Georgetown University Medical Center (GUMC). "Given this concern, we took a different approach and instead compared gray matter volume between adult bilinguals and monolinguals. We reasoned that the experience with two languages and the increased need for cognitive control to use them appropriately would result in brain changes in Spanish-English bilinguals when compared with English-speaking monolinguals. And in fact greater gray matter for bilinguals was observed in frontal and parietal brain regions that are involved in executive control."

Gray matter of the brain has been shown to differ in volume as a function of people's experiences. A prominent finding of this type was a report that London taxi drivers have more gray matter in brain areas involved in spatial navigation.

What about being bilingual leads to these advantages? To address this question the team went one step further. "Our aim was to address whether the constant management of two spoken languages leads to cognitive advantages and the larger gray matter we observed in Spanish-English bilinguals, or whether other aspects of being bilingual, such as the large vocabulary associated with having two languages, could account for this," explains Olumide Olulade, PhD, the study's lead author and post-doctoral fellow at GUMC.

The researchers compared gray matter in bilinguals of American Sign Language (ASL) and spoken English with monolingual users of English. Both ASL-English and Spanish-English bilinguals share qualities associated with bilingualism, such as vocabulary size. But unlike bilinguals of two spoken languages, ASL-English bilinguals can sign and speak simultaneously, allowing the researchers to

test whether the need to inhibit the other language might explain the bilingual advantage.

"Unlike the findings for the Spanish-English bilinguals, we found no evidence for greater [gray matter](#) in the ASL-English bilinguals," Olulade says.

"Thus we conclude that the management of two spoken languages in the same modality, rather than simply a larger vocabulary, leads to the differences we observed in the Spanish-English bilinguals."

The research team says their findings adds to the growing understanding of how long-term experience with a particular skill—in this case management of two languages—changes the brain.

Provided by Georgetown University Medical Center

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