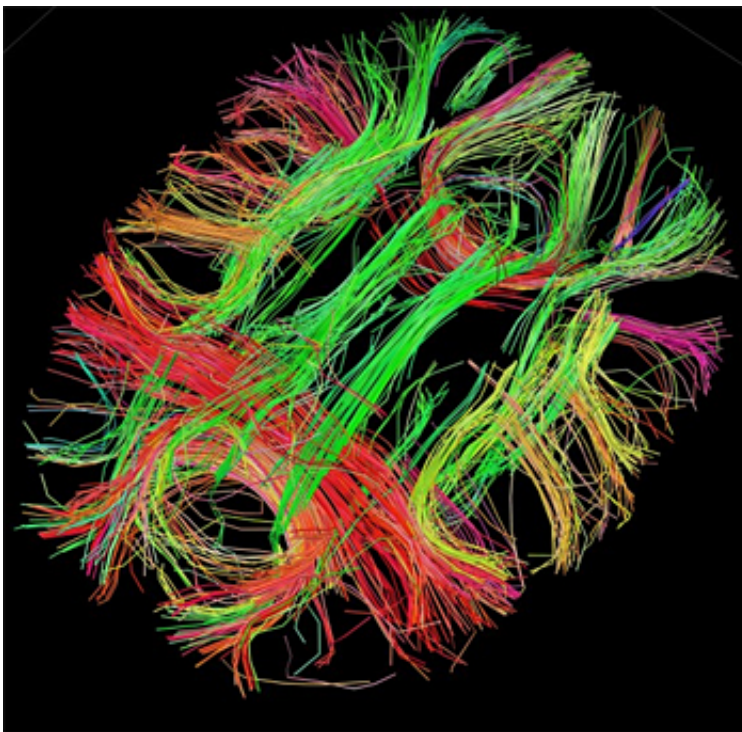


# Brain imaging proves second language learners can process language to nativelike levels

July 22 2014, by Christine Metz Howard

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White matter fiber architecture of the brain. Credit: Human Connectome Project.

With enough practice, some learners of a second language can process their new language as well as native speakers, research at the University of Kansas shows.

Using brain imaging, a trio of KU researchers was able to examine to the millisecond how the brain processes a second language. They then compared their findings with their previous results for native speakers and saw both followed similar patterns.

The research by Robert Fiorentino and Alison Gabriele, both associate professors in the linguistics department, and José Alemán Bañón, a former KU graduate student who is now a postdoctoral researcher at the University of Reading in the United Kingdom, was published this month in the journal *Second Language Research*.

For years, linguists have debated whether second-language [learners](#) would ever resemble native speakers in their ability to process language properties that differ between the first and second language, such as gender agreement, which is a property of Spanish but not English. In Spanish, all nouns are categorized as masculine or feminine, and various elements in the sentence, such as adjectives, need to carry the gender feature of the noun as well.

Some researchers argued that even those who spoke a second language with a high level of accuracy were using a qualitatively different mechanism than native speakers.

"We realized that these different theories proposing that either second-language learners use the same mechanism, or a different mechanism could actually be teased apart by using brain-imaging techniques," Gabriele said.

The team studied 26 high-level Spanish speakers who hadn't learned to speak Spanish until after age 11 and grew up with English as the majority language. The speakers used Spanish on a daily basis and had spent an average of a year and a half in a Spanish-speaking country.

They were compared with 24 native speakers, who were raised in Spanish-speaking countries and stayed in their home country until age 17.

To measure language processing as it happens, the team used a method known as electroencephalography (EEG), which uses an array of electrodes placed on the scalp to detect patterns of brain activity with high accuracy in timing.

Once hooked up to the EEG, the test subjects were asked to read sentences, some of which had grammatical errors in either number agreement or gender agreement.

The researchers then compared the results of the second-language learners to native speakers. They found that the highly proficient second-language speakers showed the same patterns of brain activity as native speakers when processing grammatical violations in sentences.

"We show that the learners' brain activity looks qualitatively similar to that of native speakers, suggesting that they are using the same mechanisms," Fiorentino said.

The study highlights the brain's plasticity and its ability to acquire a new complex system even in adulthood.

"A lot of researchers have argued that there is some sort of language learning mechanism that might atrophy over the life span, particularly before puberty. And, we certainly have a lot of evidence that it is difficult to process your second language at nativelike levels and you have to go through quite a bit of effort to find people who can," Gabriele said. "But I think what this paper shows is that it is possible."

Gabriele and Fiorentino are working on a second phase of the research,

studying how the brain processes a second language at the initial stages of exposure. Their preliminary results suggest that properties that are shared between the first and second language show patterns of [brain activity](#) that are very similar in learners and [native speakers](#). This suggests that learners build on the representation for language that is already in place when learning a second [language](#).

Provided by University of Kansas

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