

# In immersion foreign language learning, adults attain, retain native speaker brain pattern

March 28 2012

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A first-of-its kind series of brain studies shows how an adult learning a foreign language can come to use the same brain mechanisms as a native speaker. The research also demonstrates that the kind of exposure you have to the language can determine whether you achieve native-language brain processing, and that learning under immersion conditions may be more effective in reaching this goal than typical classroom training. The research also suggests that the brain consolidates knowledge of the foreign language as time goes on, much like it does when a person learns to ride a bike or play a musical instrument.

The latest in this series of studies was published online in today's [PLOS ONE](#) by researchers from Georgetown University Medical Center (GUMC) and the University of Illinois at Chicago.

"In the last few years, research has begun to suggest that adults learning a foreign language can come to rely on the same brain mechanisms as [native speakers](#) of a language, and that this might be true even for those parts of a foreign language that are particularly difficult to learn, such as its grammar," explains Michael Ullman, Ph.D., a professor of [neuroscience](#) at GUMC and senior investigator of the studies. "We confirmed this in our studies."

However, even if it's true that foreign language learners might be able to achieve native-like processing of grammar, Ullman says it has not at all

been clear just how they can get there that is, what exactly allows a learner to attain native-like processing.

Ullman and lead author Kara Morgan-Short, Ph.D., from the University of Illinois at Chicago, first tested whether the conditions under which a person learns a foreign language matter. Specifically, is the type of foreign language exposure typically found in classrooms, with a lot of explanations about the grammar, more or less beneficial than the type of exposure in an immersion situation, in which there are no such explanations, but simply many language examples?

"Surprisingly, previous studies have found that the type of exposure typically found in classrooms leads to better learning than that typically found in immersion. However, no studies have looked at the actual brain mechanisms after different types of exposure," Morgan-Short says. Also, because a foreign language is so slow to learn, previous studies have not examined the outcomes of different types of exposure beyond the early stages of learning, since it would take far too long to wait until participants reached high proficiency, she says.

To get around this problem, the scientists came up with a clever solution. Rather than teach people a full foreign language, they taught them a very small one, with only 13 words, which referred to the pieces and moves of a computer game. The language itself was made-up, and its grammar was constructed so that it was like that of other natural languages, but differed from the participants' native language English in important respects, such as its grammatical structure.

The scientists found that after a few days, adults had indeed reached high proficiency in the language, whether they had undergone classroom- or immersion-like training. However, measures of brain processing showed that different types of training led to different brain mechanisms.

"Only the immersion training led to full native-like brain processing of grammar," Ullman says. "So if you learn a language you can come to use native language brain processes, but you may need immersion rather than classroom exposure." (These results were published online Aug. 23, 2011 in the *Journal of Cognitive Neuroscience*.)

For the study published in *PLoS ONE*, the researchers asked another very interesting question: What happens after you've reached high proficiency in a foreign language, if you're not regularly exposed to it? Do you lose the use of any native-language brain mechanisms that you've attained? Many learners do not always have ongoing exposure, which makes this is a critical question, Ullman says.

So, without having warned their research participants beforehand, the researchers called them an average of five months later, and asked them to come back for another round of brain scanning. Because the language was made-up, the scientists were sure that the participants hadn't had any exposure to it during this entire time.

The researchers weren't sure what they would find, since this was the first study examining the brain after such a period of no exposure. However, previous studies testing only proficiency changes found, not surprisingly, that foreign language learners generally did worse after such periods, so the scientists assumed that the brain would also become less native-like.

"To our surprise, the participants actually became more native like in their brain processing of grammar," Ullman says. "And this was true for both the classroom and immersion training groups, though it was still the case that only the immersion group showed full native-like processing."

Ullman believes that, over time, memory of the language was "consolidated" in the brain, probably by the same mechanisms that also

underlie native language. He says this process is probably similar to the consolidation of many other skills that a person might learn, such as learning to ride a bike or play a [musical instrument](#).

Interestingly, the participants showed neither improvements nor loss of proficiency during the same five month period, even as their brains became more native like, Ullman says. The scientists are uncertain why this might be, though it is possible that proficiency changes might in fact have been observed with more precise measures, or that improvements had occurred some time after training but then were gradually lost in the absence of practice during the five months.

Ullman says that even without any observed changes in proficiency, the brain changes are important. "[Native language brain](#) mechanisms are clearly well suited to language, so attaining their use is a critical achievement for [foreign language](#) learners. We suspect that this should lead to improved retention of the language as well as higher proficiency over time."

Provided by Georgetown University Medical Center

Citation: In immersion foreign language learning, adults attain, retain native speaker brain pattern (2012, March 28) retrieved 5 May 2024 from <https://medicalxpress.com/news/2012-03-immersion-foreign-language-adults-retain.html>

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