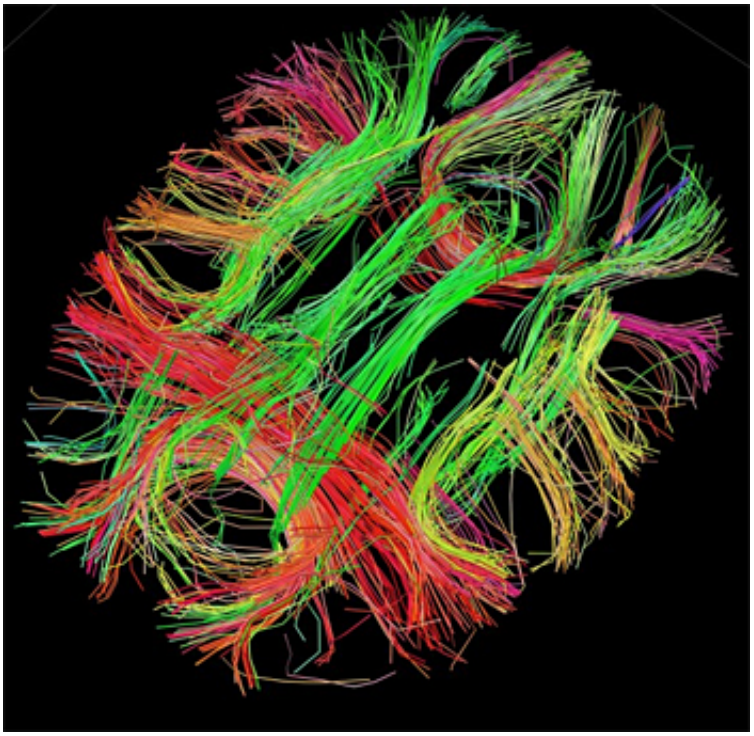
Brain pattern predicts how fast an adult learns a new language

May 10 2016



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

Some adults learn a second language better than others, and their secret may involve the rhythms of activity in their brains.

New findings by scientists at the University of Washington demonstrate that a five-minute measurement of resting-state brain activity predicted

how quickly adults learned a second language.

The study, published in the June-July issue of the journal *Brain and Language*, is the first to use patterns of resting-state brain rhythms to predict subsequent language learning rate.

"We've found that a characteristic of a person's brain at rest predicted 60 percent of the variability in their ability to learn a second language in adulthood," said lead author Chantel Prat, a faculty researcher at the Institute for Learning & Brain Sciences and a UW associate professor of psychology.

At the beginning of the experiment, volunteers—19 adults aged 18 to 31 years with no previous experience learning French—sat with their eyes closed for five minutes while wearing a commercially available EEG (electroencephalogram) headset. The headset measured naturally occurring patterns of brain activity.

The participants came to the lab twice a week for eight weeks for 30-minute French lessons delivered through an immersive, virtual reality computer program. The U.S. Office of Naval Research—who funded the current study—also funded the development of the language training program.

The program, called Operational Language and Cultural Training System (OLCTS), aims to get military personnel functionally proficient in a foreign language with 20 hours of training. The self-paced program guides users through a series of scenes and stories. A voice-recognition component enables users to check their pronunciation.

Watch a video demonstration of the language software:

To ensure participants were paying attention, the researchers used

periodic quizzes that required a minimum score before proceeding to the next lesson. The quizzes also served as a measure for how quickly each participant moved through the curriculum.

At the end of the eight-week language program, participants completed a proficiency test covering however many lessons they had finished. The fastest person learned twice as quickly but just as well as the slower learners.

The recordings from the EEG headsets revealed that patterns of brain activity related to language processes were linked the most strongly to the participants' rate of learning.

So, should people who don't have this biological predisposition not even try to learn a new language? Prat says no, for two reasons.

"First, our results show that 60 percent of the variability in second language learning was related to this brain pattern—that leaves plenty of opportunity for important variables like motivation to influence learning," Prat said.

Second, Prat said it's possible to change resting-state brain activity using neurofeedback training—something that she's studying now in her lab. Neurofeedback is a sort of brain training regimen, through which individuals can strengthen the brain activity patterns linked to better cognitive abilities.

"We're looking at properties of brain function that are related to being ready to learn well. Our goal is to use this research in combination with technologies such as neurofeedback training to help everyone perform at their best," she said.

Ultimately, neurofeedback training could help people who want to learn

a second language but lack the desirable brain patterns. They'd do brain training exercises first, and then do the language program.

"By studying individual differences in the brain, we're figuring out key constraints on learning and information processing, in hopes of developing ways to improve language learning, and eventually, learning more generally," Prat said.

More information: Chantel S. Prat et al, Resting-state qEEG predicts rate of second language learning in adults, *Brain and Language* (2016). DOI: 10.1016/j.bandl.2016.04.007

Provided by University of Washington