Proficiency and brain structure during intense language learning

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Foreign language acquisition can lead to changes in brain structure in young adults. Conscripts at the Swedish Armed Forces Interpreter Academy study at a rate that is incomparable in the Swedish education system; going from no prior knowledge in a foreign language to near fluency in a year.

Structural MRI before and after 3 months of training revealed grey matter increases in the left middle frontal gyrus, left inferior frontal gyrus, left superior temporal gyrus and the right hippocampus. Grey matter increases were related to later language performance, with higher increases in the right hippocampus and left superior temporal gyrus for interpreters with better performance at the end of training. On the other hand, participants who had to work relatively harder to achieve the goals of the academy exhibited the most widespread cortical change in the middle frontal gyrus.

A possible explanation is that participants with larger increases in the middle frontal gyrus put more strain on the articulatory network for difficult speech reproduction and processing of languages that consisted of Dari, Arabic or Russian. Preliminary findings from probabilistic tractography between the inferior frontal gyrus and middle frontal gyrus indicate higher increases in fractional anisotropy for individuals who had to work harder to achieve the goals of the academy. Change scores were at least partially dependent on starting values with larger increases and more work required for individuals with lower fractional anisotropy scores in part of the articulatory network prior to entry at the academy.