Brain Structures of Early Diglossic Bilinguals: Impact of German / Swiss German Bilingualism on Grey Matter Density of Young Adults

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The authors of this study examined the exposure to one or two languages before age of 7 among French- and Swiss German (CH-GER)- speaking young adults on differences in the grey matter density. The hypothesis is that CH-GER can be considered as an autonomous language, and consequently the CH-GER-speaking population are early bilinguals, because they talk CH-GER as well as German at a young age. Based on the literature, we examined whether the CH-GER population would have increased grey matter density in the regions of the left and right inferior parietal cortex, left inferior frontal gyrus, and anterior cingulate cortex, compared to the monolingual French-speaking population of Switzerland.
Participants were right-handed students from the University of Fribourg, Switzerland, who were monolingual, CH-GER- or French-speaking, with good general health who had learned their second / third language after age 7. Subjects replied to several questionnaires about their language skills, daily exposure to and age of acquisition of their second language (L2). Subsequently, subjects had an MRI and the T1-weighted anatomical scans were processed using Statistical Parametric Mapping SPM12, and analyzed with Voxel- and Surface-Based-Morphometry. A two-sampled t-test was then performed to compare the two groups with first language L1-CH-GER and L1-FR. An ANCOVA test was performed to exclude cofounds.
A total of 27 subjects were eventually enrolled in the study, and there were no significant differences between the two groups in age, number of spoken languages and proficiency but with a significant difference in the daily exposure to and age of acquisition of L2.
The results showed a significant increase of left and right inferior parietal cortex in the volume ($F=21.49$, $p=<0.001$*) and cortical thickness ($F=21.61$, $p=<0.001$*) of L1-FR as well as the cortical thickness of the left inferior frontal gyrus ($F=14.24$, $p=<0.001$*). In conclusion the study had to reject the hypotheses due to an increase in the structure of the French-speaking group possibly related to phonological and syntactic processes as well as linguistic experiences and characteristics.

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