

Young children in different linguistic environments: A multimodal neuroimaging study of the inferior frontal gyrus

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Abstract

Magnetic resonance imaging (MRI) studies show that bilingual adults display structural and functional brain alterations, especially in the inferior frontal gyrus (IFG), dependent on when they learned their second language. However, it is unclear whether these differences are due to early exposure to another language, or to lifelong adaptation. We studied 22 children aged 3–5 years growing up in a multilingual environment and 22 age- and sex-matched controls exposed to an English-only environment. Resting-state functional MRI and T1-weighted MRI were used to assess functional connectivity and structure of the IFG. Children in a multilingual environment had

higher functional connectivity between the left IFG and dorsal language and attention areas compared to children from a monolingual environment. Children in a multilingual environment also displayed decreased functional connectivity to temporal, anterior cingulate, and prefrontal areas. No significant group differences in IFG structure were observed. Our results suggest a more integrated functional language network, which is more segregated from other networks, in children who grow up in a multilingual environment. These findings suggest that functional alterations to the IFG due to second language learning occur early, while structural changes may not be apparent until later.

Keywords: Bilingualism, fMRI, Language, Inferior frontal gyrus, Brain structure, Functional connectivity